Refrigeration Service Engineer

Vol. 4
No. 10

OCTOBER • 1936

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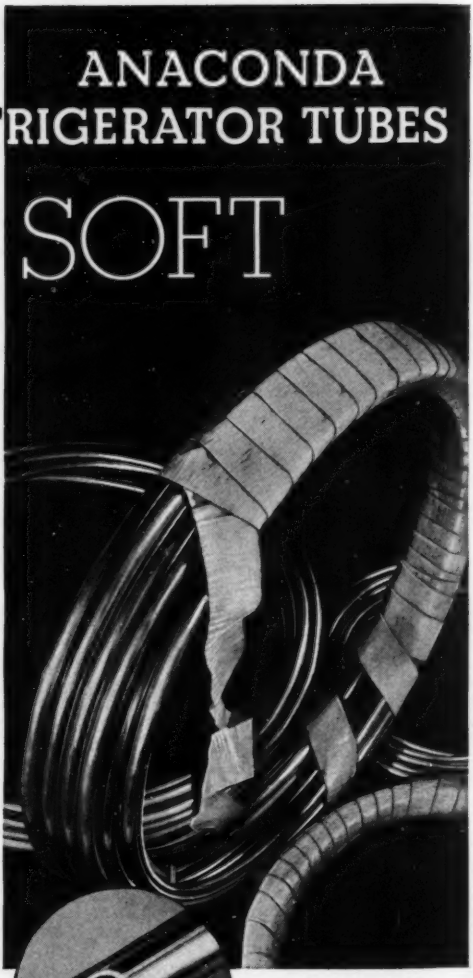

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Devoted to the Servicing of

REFRIGERATION UNITS *and* OIL BURNERS

VOL. 4 OCTOBER, 1936 NO. 10

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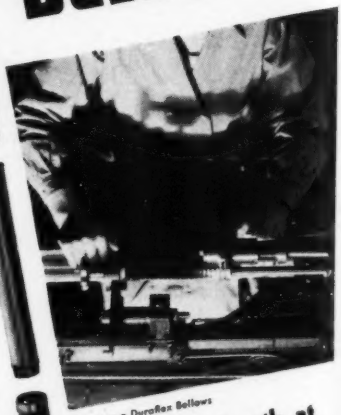

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The Refrigeration Service Engineer

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OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

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"Refrigeration Storage"

Providing "Hold-Over" Refrigeration Capacity with a Small Compressor to Meet a Peak Load Several Hours Per Day. Suggestion for System.

By GEORGE H. CLARK, B.S., M.E.*

OCCASIONALLY in various refrigeration problems it becomes necessary or at least advisable to store refrigeration for some period of time. For example, on a dairy farm milk may be cooled in large quantities at two separate periods during the day. The rate at which heat is removed from the milk is very high and if a refrigerating machine was to be used which had sufficient capacity to cool the milk as fast as necessary, the machine would have to be a large refrigerating unit, and the refrigerating machine might operate not more than two hours out of the twenty-four. If we provide some means of storing refrigeration, it is possible that we may operate a smaller refrigerating machine over a period of possibly six to twelve hours to supply the necessary refrigeration which will be required in one hour's time in cooling the large quantity of milk.

Another example in which it may be found economical to store refrigeration obtained over a period of hours for use in a comparatively short time might be in connection with the air conditioning of an undertaking parlor, or church, or other building which is used for only short periods one or two times a day. In this case also it might be economcial to use a comparatively small condensing unit in order to store up refrigeration for a period of hours, the total quantity of refrigeration being used in approximately one hour's time.

In general, the method used in storing refrigeration in this way has consisted in cooling a large quantity of brine down to a low temperature and then, as refrigeration was required at a high rate, the brine was circulated through coils which picked up the heat at a high rate for a comparatively short period of time.

Thus, in connection with milk coolers, it has been customary to use a large tank of calcium chloride or other brine which is cooled by a refrigerating machine and when it was desired to cool milk, a brine circulating pump circulated the cold brine through the milk cooler. This has worked out quite satisfactorily except for the fact that the quantity of brine required to store the large amount of refrigeration necessitates a large brine tank. Also, when we first start to

*President, Detroit School of Refrigeration, Chairman National Educational and Examining Board, R. S. E. S.

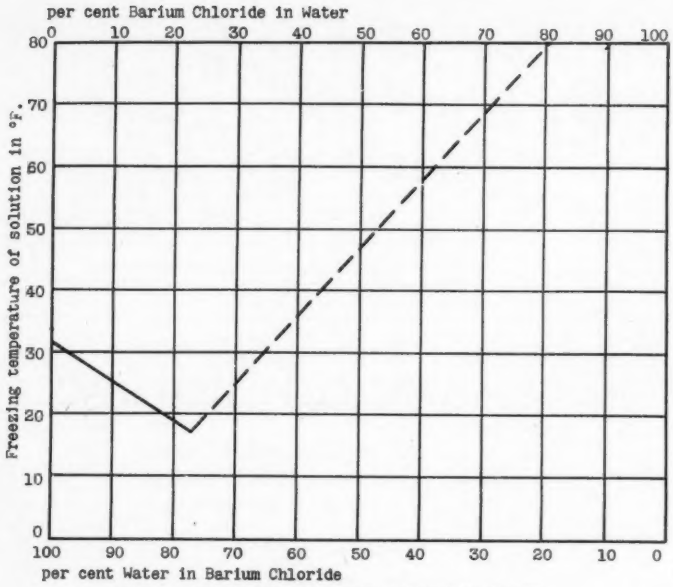
per cent Barium Chloride in Water
0 10 20 30 40 50 60 70 80 90 100
Freezing temperature of solution in °F.
80 70 60 50 40 30 20 10 0
100 90 80 70 60 50 40 30 20 10 0
per cent Water in Barium Chloride

FIG. 1. EUTECTIC FREEZING SOLUTION CHART

cool the milk, the temperature of the brine is lower than it is when we are finishing up the cooling of that particular batch of milk. A better method which does not require such a large brine tank and which avoids the varying temperature which we have in using brine for refrigeration storage, consists in using a brine which may be frozen and refrigeration stored in this manner.

In connection with air conditioning work where the coil temperatures are not required to be very low—possibly temperatures between 40° and 50° will be sufficiently low—then we may freeze water into ice and then during the short period when refrigeration is being used we can circulate water through the tank which contains the ice. The water which leaves the tank may leave at a temperature slightly above the temperature of the melting ice, while the return water into the tank may be at a temperature of somewhere between 45° and 50°. Thus if we use a 1-hp. refrigerating machine, we could freeze a considerable quantity of ice during the period of ten hours; then we could make use of that quantity of ice in one hour's time, when our refrigeration load is high.

In the case of a milk cooler or other requirement for a high rate of refrigeration where the temperature should be below 40°, freezing water into ice does not store the refrigeration at a sufficiently low temperature. In this case we may use what we call a eutectic freezing solution, which is a solution of water and some salt or other compound which is of the proper strength so that the solution may freeze all at one temperature. This freezing temperature we refer to as the eutectic freezing point.

The action of a eutectic freezing solution can be explained by the diagram of Figure 1. In this diagram we show temperatures ranging downward from 50° to 0°, and along the horizontal line we show the percentage of compound in solution with the water. As an example, we may think of a eutectic solution of barium chloride. Reading the top of our chart, we have a solution which is 0% barium chloride or 100% water and we proceed to the right increasing our percentage of barium chloride up to 100% at the right hand side, which of course indicates 0% water, and the various intervening strengths of solution are indicated in per-

centages. If we start with a solution which is 100% water and no barium chloride, the freezing temperature is 32°. If we have the solution consisting of 10% barium chloride and 90% water, we have a freezing temperature somewhere in the neighborhood of 21°.

If we start to freeze this solution of 10% barium chloride, what actually happens is that water freezes out of solution, leaving all of the barium chloride in solution with the remaining water. Since some of the water has passed out of the solution while none of the barium chloride has passed out, the resulting solution is stronger in barium chloride and eventually may reach a 20% solution. In this case the freezing temperature is lower and as we were freezing water out of solution, we actually had a variable freezing temperature and we continue to freeze water out of the solution until we have reached a solution containing 23% barium chloride and 77% water.

High Freezing Temperatures

On the other hand, if we read the bottom of our chart where we have a solution consisting of 100% barium chloride and no water, we would have a very high freezing temperature and as we add water to the solution, we lower the freezing temperature. If we started with a solution consisting of 90% barium chloride and 10% water, we would find that as we froze part of the solution, we would actually be freezing barium chloride out of the solution, leaving the remaining solution weaker in barium chloride and thus containing a greater percentage of water. As we continue to freeze out barium chloride, our solution continues to become weaker in barium chloride and stronger in water until we have reached a solution consisting of 23% barium chloride and 77% water. This solution containing 23% barium chloride is what we refer to as a eutectic solution; and as we freeze this solution, we freeze out water and barium chloride in the ratio of 23 parts barium chloride to 77 parts of water with the result that our remaining solution is still of the same strength and consequently the whole solution will freeze at the eutectic freezing temperature, which happens to be at a temperature of approximately 17° for this solution.

Thus if we start freezing when we have a solution consisting of 23% barium chloride and 77% water, we will not freeze any of the solution until the temperature is reduced to approximately 17°. Then as heat is removed, the solution will start to freeze and continue to freeze until the solution is all frozen at that temperature, after which the whole cake of ice may have its temperature lowered. As we stop refrigerating and heat is added to this ice, the temperature will warm up to 17° and then the whole quantity of ice will melt at a temperature of 17° and absorb a considerable quantity of heat.

Thus if we were to require a considerable amount of refrigeration stored at a comparatively low temperature, we might use a solution of barium chloride and water consisting of 23 parts barium chloride by weight and 77 parts of water.

Milk Cooling

In connection with a milk cooler, it might be desirable to have refrigerating coils located in this tank containing a solution of barium chloride and water for the purpose of removing heat from the solution. We may also locate another coil in this tank through which we may circulate a calcium chloride brine of sufficient strength to insure that it does not freeze. The calcium chloride brine could then be passed through the milk cooler, removing heat from the milk, while its temperature is raised, and then it could be passed through the coil in the tank containing the eutectic solution of barium chloride where its temperature will be reduced as it gives up heat to the barium chloride solution.

In this way we may obtain a constant low temperature in our calcium chloride solution for a considerable period of time, provided a coil of sufficient size is used in the tank, and the size of tank required to store refrigeration in this way will be considerably less than will be required to store refrigeration simply by lowering the temperature of a large quantity of brine.

In general it makes the same difference between refrigerating with a cake of ice and refrigerating with a large tank of water at a low temperature. Barium chloride is

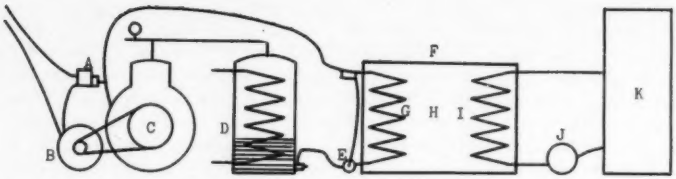

FIG. 2—DIAGRAM OF EQUIPMENT FOR MILK COOLING INSTALLATION

A—Pressure Control. Set 0-14 lbs.
B—Motor
C—Compressor
E—Methyl Chloride Thermostatic Expansion Valve
F—One Hundred Gallon Tank to take care of 1000 lbs. of milk, 95° to 40°
G—Methyl Chloride Coil
H—BA. CL. Brine, 23% BA. CL. and 77% Water
I—Brine Coil
J—Brine Pump
K—Milk Cooler

only one material which might be used and will give us a temperature practical for use in connection with milk coolers or possibly in connection with an air conditioning installation. Other solutions may be obtained which will give us eutectic freezing temperatures varying all the way from the 32° freezing temperature of water down to sub-freezing temperatures.

Figure 2 shows a schematic diagram of the complete equipment for a dairy milk cooling installation.

The Storage of Refrigerants

The Handling and Storage of Refrigerants in Cylinders. Space Must Be Left for Expansion. Determining Storage Capacity of Receivers. Other Pointers for Service Men.

By L. K. WRIGHT, *A.S.R.E.*

THE old adage that familiarity breeds contempt very aptly applies to service men and their treatment of refrigerant cylinders. Despite the knowledge that the refrigerants are under pressure and that serious accidents result from time to time through carelessness the average service man is but casually concerned about the handling and storage of refrigerants in cylinders.

Expansion of Liquids

Some of the liquid refrigerants show great expansivity. Sulphur dioxide, in liquid form, has an expansion of 14 per cent at 120° F. from 0° F.

To illustrate this expansivity a table giving the cubic inches of space occupied by one pound of liquid sulphur dioxide at various temperatures is shown in the table which follows:

TABLE I. SPACE OCCUPIED BY ONE POUND OF LIQUID SULPHUR DIOXIDE AT VARIOUS TEMPERATURES

Deg. Fahr.	Cu. In.
0	18.7
20	19.1
40	19.5
60	19.9
80	20.3
100	20.8
120	21.4

It is essential therefore that cylinders be filled with such amounts of refrigerants that a vapor or expansion space exists, so a rise in temperature will not induce a hydrostatic pressure with consequent rupture of the vessel or cylinder.

Regulations Concerning Refrigerants

The Interstate Commerce Commission provides certain specifications for refrigerant cylinders, not only standards for materials,

testing and manufacture, but of filling capacities. The filling capacity is designated as the per cent ratio of the weight of refrigerant in a cylinder to the weight of water the container will hold. Due to the difference in specific weights a refrigerant cylinder will provide storage for different amounts of various refrigerants.

Where time permits and great exactness is desired the capacity of a vessel can be determined by filling it with water and noting the weight. Such a procedure will provide the water capacity and from it the allowable refrigerant capacity can be determined.

Needless to say such means of determining capacity necessitates the thorough evacuation, cleaning and drying of the vessel before refrigerant can be admitted or stored in the cylinder.

Table II, assembled from data given in the Bureau of Explosives Pamphlet No. 9, which provides the regulations of the Interstate Commerce Commission, gives the maximum filling density for refrigerant and gas storage.

Inasmuch as the storage capacity as defined by the I. C. C. regulations is dependent upon the weight of water a vessel will hold, it is first necessary to ascertain the capacity and then determine the water content.

TABLE II. MAXIMUM FILLING DENSITY FOR REFRIGERANT AND GAS STORAGE

Refrigerant	Maximum Capacity Per Cent
Anhydrous Ammonia	54
Monomethylamine	54
Carbon Dioxide	68
Nitrous Oxide	68
Hydrogen Sulphide	68
Isobutane	50
Methyl Chloride	75
F-12	118
Sulphur Dioxide	125
Chlorine	125

Quick Means of Determining Capacity

To provide a quick means of determining capacity, Table III giving the capacities of cylinders in cubical and water content was prepared.

This table is based on actual inside dimensions and gives capacities of common sizes of vessels encountered in the household and small commercial field.

The large table IV which gives the number of ounces of refrigerant to fill a vessel, such as a service or storage cylinder, or a receiver, to allowable capacity per foot of vessel length.

The cylinders or receivers are assumed to have flat heads or ends. Where a dished or bumped head is encountered take half the length of the crown. Thus, where a bulged

TABLE III. CAPACITY OF CYLINDERS IN CUBICAL AND WATER CONTENT

Diameter In Inches....	1	1¼	1½	2	2½	3	3½	4	4½	5	6	8	10
End Surface Sq. In.	.7854	1.227	1.767	3.141	4.908	7.068	9.621	12.56	15.90	19.63	28.27	50.26	78.54
Cu. In. Capacity Per Ft.	9.425	14.72	21.2	37.69	58.8	84.7	115.4	150.8	190.8	235.6	339.24	603.18	942.48
Oz. of Water Per Ft.	5.46	8.54	12.3	21.86	34.10	49.13	66.93	87.5	110.7	136.7	196.7	349.9	546.7

Above based on Inside Measurements, per Foot of Length

TABLE IV. OUNCES OF REFRIGERANT TO FILL RECEIVER OR CYLINDER TO ALLOWABLE CAPACITY PER FOOT OF VESSEL LENGTH

Refrigerant	Internal Diameter of Vessel in Inches												
	1	1.25	1.5	2	2.5	3	3.5	4	4.5	5	6	8	10
Carbon Dioxide	3.7	5.8	8.3	14.9	23.2	33.4	45.5	60.5	75.2	92.9	133.8	237.9	371.7
Methyl Chloride	4.1	6.4	9.2	16.4	25.6	36.9	50.2	65.7	83.0	102.5	147.5	262.4	410.0
Ethyl Chloride	4.0	6.3	9.0	16.2	25.3	36.4	48.5	64.5	81.9	101.2	145.6	258.9	402.8
Butane	2.7	4.1	5.9	10.5	16.4	23.6	32.2	42.0	53.2	65.6	94.4	167.0	262.5
Isobutane	2.5	4.0	5.7	10.1	15.7	22.6	30.8	40.3	50.9	62.9	90.5	160.9	251.5
Propane	2.4	3.8	5.4	9.6	15.0	21.6	29.5	38.5	48.8	60.2	86.5	154.0	240.5
Sulphur Dioxide	6.8	10.6	15.3	27.3	42.6	61.4	83.7	109.4	138.3	170.9	245.9	437.3	685.3
F-12 (Freon)	6.4	10.0	14.4	25.8	40.1	57.7	78.9	102.8	130.0	160.7	231.2	411.1	644.2
Ammonia	2.9	4.6	6.6	11.8	18.4	26.6	36.1	47.3	59.7	73.8	106.2	188.9	295.2

head extends two inches, consider the length of the head section as one inch in estimating capacity.

Finding Capacity

To find the storage capacity of a receiver 4¼ in. outside diameter and 8 in. long, where F-12 is the refrigerant, determine as:

$$\frac{\text{oz. given in table} \times \text{length in inch}}{\text{oz. per lb.} \times \text{inch per ft.}} \text{ or,}$$

using data above problem, resolves itself as:

$$\frac{102.8 \times 8}{16 \times 12} = \frac{25.7}{6} = 4.3 \text{ lbs.}$$

As .1 lb. equals 1.6 oz., the answer may be reduced to $3 \times 1.6 = 4.8$ oz. or the full determination of 4 lb. 4.8 oz.

Service Cylinder

Assuming a small service cylinder is to be filled to allowable capacity with sulphur dioxide, first determine length and diameter. Assume cylinder has both heads crowned, diameter of 4¼ in. and a total overall length of 9½ in. Internal diameter will be estimated as 4 in. and effective length 9 in., taking off ¼ in. for thickness of heads.

Thus, the problem resolves itself as follows:

$$\frac{109.4 \times 9}{16 \times 12} = \frac{975.6}{192} = 5.08$$

or 5 lb. storage capacity for sulphur dioxide.

The allowable capacities must not be exceeded, for a gas space must be left in all cylinders, drums or receivers, otherwise rupture is apt to occur if the stored liquid increases in temperature.

Where receivers are concerned it must be borne in mind that a certain amount of oil is also involved, usually from ¼ to ⅓ the weight of the refrigerant. Receivers in normal service should be estimated to operate about one-quarter to one-third filled with refrigerant and oil. This will leave space if the installation requires pumping down.

The use of the chart will save a great deal of time and provide safe filling. It takes but a minute to determine the capacity of a vessel by this method and in the interest of safety is time well spent.

Servicing the Fairbanks-Morse Refrigerator *(4th Article)*

Instructions on the Light Switch Assembly, Refrigerant Supply, Purging, Dehydrating, and Charging with Sulphur Dioxide and Oil.

FOR replacing the light switch assembly, proceed in accordance with the following directions:

1. Remove the temperature control assembly from the evaporator front.

2. Remove the spiral tube from its clamp at the rear of the evaporator.

3. Remove the terminal cover from the temperature control and disconnect the three wires.

4. Remove the terminal screw to which the copper busbar leading to the light switch assembly is connected.

5. Remove the machine screw which extends through the top end rail of the temperature control, which fastens the light unit to the control. This screw is located near the light operator rod.

The replacement assembly should be installed by reversing the above procedure.

Caution: When connecting the wires, refer to the wiring diagram to be sure that the wires are properly connected.

Checking the Refrigerant Supply

A simple method for quickly checking the amount of refrigerant in the system is to feel the liquid level in the liquid receiver. This can be accomplished by covering the inside (fan side) of the condenser with a sheet of paper. Then start the unit and

FIG. 14. BELOW, WIRING DIAGRAM FOR MODELS C-5, C-6 and C-65

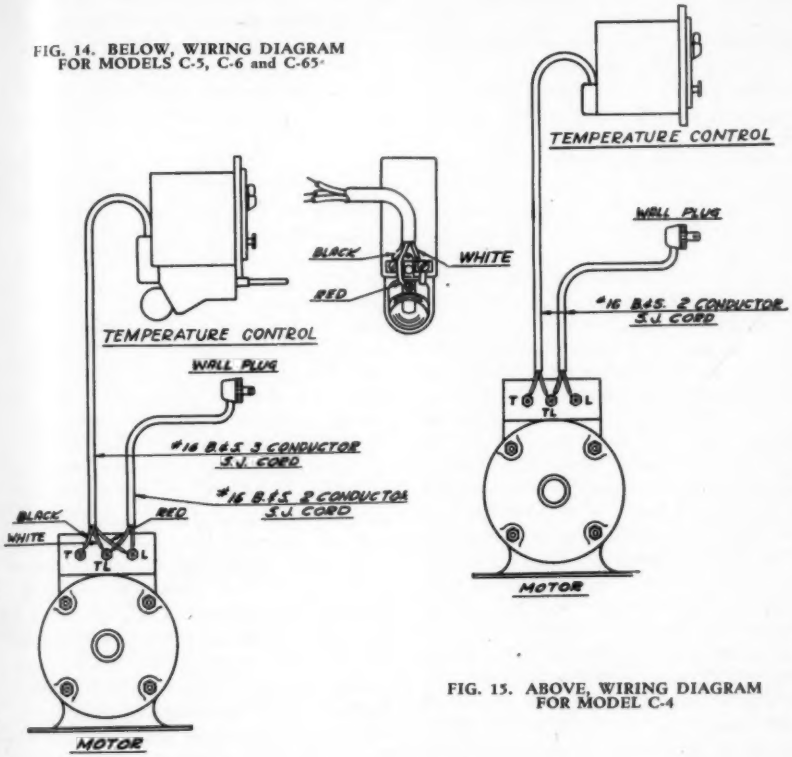

FIG. 15. ABOVE, WIRING DIAGRAM FOR MODEL C-4

allow it to run about ten or fifteen minutes. The upper portion of the receiver will feel warm and a distinct point will be found where the tank feels cool, indicating the liquid level.

If the liquid level covers the liquid line shut-off valve one or two inches, the machine should operate correctly; but, since part of this may be oil, it is good practice to see that the liquid receiver is one-third to two-thirds full of liquid sulphur dioxide.

If a refrigerator is found to be short of refrigerant it may be the result of careless charging or an indication of a leak. The instructions for locating a leak which are given in another section should be followed. If the system is extremely short of refrigerant, the head pressure will be abnormally low. However, slight shortages have either no effect on the head pressure or increase it slightly, because the expansion valve is allowing warm vapor to enter the evaporator. The warm vapor does not tend to cool the evaporator, which results in a partially frosted evaporator and a resulting high back pressure. If the ear is placed alongside the evaporator, the hissing sound of this vapor coming through the expansion valve will be heard instead of the usual sound of liquid boiling, which is heard when the expansion valve is allowing the liquid to enter. It will be noticed, however, that the liquid line, as well as the receiver tank, will be abnormally warm.

When a unit is found to be short of refrigerant, the first step to be taken is to make a thorough check of the unit for leaks in accordance with the procedure given for that operation. After the leak has been located and the necessary repairs made, an

additional supply of refrigerant must be added, as follows: (Note: This procedure should not be confused with the instructions given for charging the system, because in charging a system, the correct amount of refrigerant is put into a system that is known to contain no refrigerant at all. In this case, the supply of refrigerant is merely being replenished.)

1. Install the pressure gauge in accordance with the information given for that operation.

2. Remove the port plug from the suction service valve (first being sure that the port is closed off). Install fitting and attach a short charging line. Install another short charging line on the service drum valve and connect the two lines with a ¼ in. flare tee, on which a compound gauge has been installed. The tank must be in an upright position so that the sulphur dioxide is added as vapor. Never allow liquid refrigerant to enter the suction side of the compressor.

3. Purge this line by leaving the flare nut at the suction service valve loose and opening the valve on the service drum momentarily, after which the connection at the service valve should be tightened.

4. Open the suction service valve port and close off the suction line of the system by turning the suction service valve stem to the right until it seats. The compound gauge now shows the pressure in the crankcase of the compressor.

5. Start the unit and slightly open the valve on the service drum simultaneously. The service drum valve now acts as a regulating valve which limits the flow of refrigerant from the drum to the compressor.

6. Allow the compressor to run for several minutes, during which time the service drum valve should be opened or closed, as necessary, to maintain an approximate five-pound pressure in the crankcase and charging line. This pressure is checked by closely watching the compound gauge which was installed in the charging line for this purpose.

7. Allow the compressor to operate until approximately eight ounces of refrigerant has been taken into the system. The drum may be placed on the scale and the subtraction of the weight from the drum noted. However, after a little practice, the service man will be able to estimate this amount with a reasonable degree of accuracy. (a) If the refrigerant in the drum becomes so cold that the required five pounds pressure cannot be maintained, the drum should be carefully heated.

8. The unit should now be stopped and the service drum valve closed. Open the suction line on the system by turning the suction service valve stem to the left.

9. Start the unit and repeat the tests for refrigerant shortage.

10. If the unit still checks short of refrigerant, the above operation should be repeated, adding another six to eight ounces.

11. When sufficient refrigerant has been added, the charging apparatus should be removed as follows: Turn the service drum valve stem to the right, allowing the refrigerant remaining in the charging line to be drawn into the system. When the compound gauge shows that there is zero (0) pressure in the charging line, the suction service valve port should be closed and the charging equipment removed. When the flexible line manifold hook-up is used, the procedure is the same with the following exceptions: (a) The charging line from the drum is connected with the fitting provided for that purpose on the manifold and purged. (b) The service drum valve is opened. (c) The flow of refrigerant into the system is regulated with the valve on the compound gauge side of the manifold.

Overcharge of Refrigerant

In this type of refrigerating system, a slight overcharge will have no tendency to impair the operation of the system because ample receiver tank has been provided in which to store the excess liquid. However, if so much refrigerant has been added that the receiver tank is filled, the excess liquid will stay in the lower passes of the condenser, thereby cutting down its cooling capacity. When the system is overcharged to this extent, it will be noticed that during the operation of the unit, the receiver tank and lower passes of the condenser will be cool while the upper passes of the condenser are abnormally warm. It will also be noted that

the head pressure will be abnormally high. The back pressure in this case will be normal. However, if this condition exists, it will be noted that if the unit is shut off and allowed to cool, the head pressure will return to the normal pressure to correspond with the existing room temperature.

Air in the System

If it is found that a system contains air, it is a foregone conclusion that this air has been allowed to enter while work was being done on the system or that there is a leak in the low side through which air has been drawn while the low side of the system is operating under a vacuum. Therefore, a thorough test should be made in accordance with the instructions given in the section covering that operation. Due to the fact that air cannot be condensed by the temperatures and pressures under which these units operate, it becomes merely an inert substance which remains in the condenser and compresser head, increasing the discharge pressures and cutting down the efficiency of the condenser.

As previously mentioned, air in the system will increase the discharge pressure; and, if sufficient air is present, this pressure will become so high that the compressor operation will be slowed down, forcing the overload device to cut out.

Therefore, irregularities caused by the presence of air in the system are somewhat similar to the irregularities caused by an overcharge of refrigerant. If there is any question as to which condition is causing the trouble, the service man may easily and definitely decide this question by shutting off the unit and allowing it to cool. In the case of an overcharged system, the discharge pressure will return to a normal figure that corresponds with the pressure that is normal for the temperature of the room in which the unit is situated. However, in the case of air in the system, it will be noted that the pressure does not return to a normal figure when the unit has cooled to approximately room temperature.

Purging Sulphur Dioxide

Purging the system is done in the same manner whether the condition is due to an overcharge of refrigerant or due to the presence of air in the system. When the condition to be corrected is an overcharged system, the pressure gauge should be removed and one of the following attachments made to the gauge fitting:

1. A rubber hose may be attached, that is of sufficient length so that the open end may be placed outside of the room, through either a nearby window or door. Caution: Be sure that the end of this line is located in such a position so that the sulphur dioxide that will be blown through it will not be allowed to come in direct contact with the walls of the house or with the grass or shrubbery.

2. A short purging line may be attached and the open end of this line placed in a pail of water in which approximately one and one-half pounds of lye have been dissolved. The sulphur dioxide bubbling through the basic solution formed when the lye and water were mixed will be neutralized; and, if the purging is done slowly, the reaction will be complete and there will be no unpleasant effect in the room.

Open the discharge valve port enough to allow the sulphur dioxide either to bubble slowly through the lye-water or pass slowly through the purging hose, as the case may be. The exact amount of sulphur dioxide allowed to escape will depend entirely upon the judgment of the service man.

At intervals during this operation, it is suggested that the discharge valve port be closed and the purging line removed and the pressure gauge installed, after which the unit should be operated for a short time and a check made of the operating discharge pressure. Allowances must be made, of course, for the increase in head pressure, which is due to the higher back pressure which will result when the unit is started after having been off for some time. When the machine is found to operate at normal head pressures, sufficient refrigerant has been discharged.

Purging Air

When purging air, the above mentioned attachments may be made to the discharge valve port, but if extreme care is exercised, this operation will not be necessary. If the purging lines are used, the procedure will

be the same with the exception of the test. In this case, when the gauge has been installed on the service discharge valve after the purging operation, the pressure of the refrigerant should be compared to the normal pressure of the refrigerant when the unit is idle—not the normal operating pressure that is mentioned in the previous test, which refers to a removal of excess refrigerant from the system. This operation should be repeated until the gauge shows that the refrigerant in the unit is under normal pressure.

Note: In order to make direct comparison between the pressure in the unit and the normal pressure for the room temperature, it is absolutely necessary that the unit remain idle long enough to allow all parts of the unit to cool down to room temperature. Therefore, in cases where time does not permit the service man to allow the unit to cool down to the exact room temperature, he must make allowances for the increased pressure due to the heat that is still in the unit. When it is necessary to make these allowances, we suggest the following procedure: When the gauge is installed after each purging operation, it will be noted that the pressure has decreased. When two or three of these purging periods have passed and no further decrease in pressure is noted, the service man may be reasonably sure that the air has been removed from the unit.

Caution: In any purging operation, never try to hurry the operation. Fast purging results in the loss of oil from the system, as well as causing the liquid to boil and mix with the air in the top of the condenser and compressor, resulting in improper purging in either case.

Note: If the flexible line manifold hook-up is being used, the purge lines will of course be attached through the fitting provided on the manifold and the system purged by opening the valve on the manifold on the pressure gauge side.

Dehydrating

When the interior of a system has been exposed to either air or moisture, proper steps must be taken at once. Purging or removing the air from a system has been covered in previous paragraphs. This operation is sufficient in cases where the parts in question are exposed for a very short time in a reasonably dry room or where the air has been in the system for a very short time. However, in the event that a part has been exposed for some time, or that the air taken through a defective seal, poor connections, or careless charging, is heavily laden with moisture, the part or entire system (as the case may be) should be dehydrated.

Sulphur dioxide has no corrosive effect on the metals used in the system. However, if there is sufficient moisture present, it unites with the sulphur dioxide and a sulphurous acid is formed, which has a corrosive effect. This corrosion accounts for such cases as plugged strainers, plugged expansion valves, and both inefficient and stuck compressors.

When it is suspected that a part or parts have accumulated moisture, the parts or units should be treated as follows: The old oil and refrigerant should be discarded and any necessary repairs made. (Never use the old charge after dehydrating, as the oil and the refrigerant will hold more than enough moisture to bring back the original condition.)

Wash Parts

The parts should be flushed out or washed with carbon tetrachloride, dried, blown out with air, and placed in an oven. One side of the part or unit is then plugged with a standard flare plug or a seal cap, depending on whether the fitting is male or female, and the opposite side is connected to an auxiliary pump.

The standard Fairbanks-Morse compressor and motor may be used as an auxiliary pump. A filter should be placed in the line between the oven and the auxiliary compressor in order to protect this compressor from any dirt that may be drawn from the parts that are being dehydrated. Never pump liquid refrigerant through the auxiliary compressor and be sure that both valves on the compressor are closed when it is not in use.

The oven temperature should be maintained at a temperature of approximately 180° F. for four to six hours with a 25 in.

vacuum being pumped by the auxiliary pump during the whole period. In the case of compressors, the vacuum must be pumped on both the head and the crankcase by connecting to the respective service valves or turning the compressor shaft occasionally to insure the removal of all of the moisture through the flapper valves.

When complete units are being dehydrated, the auxiliary pump will be connected to the service valve—or valves, depending upon the system used—and the dehydrating operation will be completed as explained above. When the unit has been dehydrated, the valve should be closed before the auxiliary pump is shut off. In this case, the unit will have a good vacuum in it and is ready to be charged.

When the individual parts (such as evaporators, etc.) are dehydrated, the auxiliary pump should be disconnected and an airtight plug or seal cap applied to the open side of the part before it is removed from the oven.

When these parts are installed on a unit, they must be carefully purged.

Caution: Motors, belts, and temperature controls must never be placed in an oven. Remove them. Be sure that every part of the system is discharged before subjecting it to the heat.

Charging—Sulphur Dioxide and Oil

No allowance need be made for the oil charge in the evaporator. The total amount of oil necessary for a system will be the amount specified for the condensing unit, which is fourteen ounces in the UC-1 unit and twenty ounces in the UC-2. The proper amount of the recommended oil may be added prior to the dehydrating operation so that no loss of vacuum will be suffered after the unit has been removed from the oven.

If possible, the unit should be charged with a charging board. If, however, a charging board is not available, the proper amount of sulphur dioxide should be weighed into a small service drum. This drum is then inverted and the valve connected to the discharge service valve port with a short piece of copper tubing. The air should then be blown out of this connecting tube by loosening the flare nut in the discharge service valve port, allowing the small amount of refrigerant to enter the line by momentarily opening the service drum valve. The loose flare should then be tightened and the service drum valve opened. The discharge service valve port should then be opened approximately half way, allowing the liquid refrigerant to flow into the condenser and receiver tank. It may be necessary to apply some heat to the service drum to force all of the liquid out of the drum.

When the service drum is emptied (which may be determined by the absence of the hissing noise caused by the flowing of the refrigerant through the service drum valve), the service drum valve and discharge service valve port are closed and the drum removed.

If the service man was careful when charging his service drum to see that the proper amount, and only the proper amount, was put into the service drum, he is now assured that the proper charge of refrigerant is in the unit.

Caution: Be sure, when using this method, to charge the unit through the discharge service valve. If this procedure were followed and the refrigerant forced into the suction service valve, a crankcase flooded with liquid refrigerant would result. This condition would cause considerable trouble when the unit was started.

S S S

DRINKING SYSTEM PIPE LINES

PIPE lines in drinking water systems should be large enough to permit water circulation with a small amount of friction, yet this must not be carried too far for reason that the heat leakage may be carried beyond a desired point.

Pipe mains should be as near fountains as possible to eliminate dead ends where water will warm up and thus increase wastage.

A good practice is to base pipe size on a friction loss of not over 7 lbs. per 100 ft. of pipe.

Shop Methods and Data *(Second Article)*

Charging Units and Filling Service Cylinders

Construction and Use of Sight Charging Apparatus for Charging

Sight Charging Apparatus

THE sight charging apparatus differs from the foregoing in that it utilizes a calibrated glass tube and does not make use of a scale.

This apparatus can be easily made to order or turned out in the shop if welding or brazing equipment is at hand. A piece of 3½ inch standard steel pipe is used for the measuring cylinder body. Heads of ⅜ inch steel should be welded in and bosses for the various valves and connections should be built up. It is best to build up one boss first and to drill it so as to act as a vent before trying to weld in the heads.

As may be noted by examining the sketch (Fig. 4) a glass tube, preferably of ⅝ inch size, with a ⅜ inch bore, is mounted between two safety gauge cocks. These gauge cocks are widely used on ammonia machines and are provided with small balls which seat and prevent release of refrigerant in the event of breakage of the glass tube.

Ammonia fittings and valves make the best equipment for apparatus of this type, as they are of forged steel and much heavier than the designs used in the brass and bronze types.

The internal diameter of 3½ inch standard black steel pipe is such that its transverse internal area is 9.886 sq. in. A glass tube of ⅜ inch internal diameter has a transverse area of about .114. The combined transverse area is therefore 10 square inches.

Basic data is given in the following chart, providing information regarding the density of refrigerants in pounds per cubic foot, density in ounces per cubic inch, ounces of refrigerant per inch length of cylinder and inches of cylinder length per ounce of refrigerant.

This data, together with that given under the heading of Cylinder Marking Data enables the shop man to build and equip the apparatus with the proper right scale. The scale is best made of a heavy strip of drawing board stock or of celluoid, so that moisture or atmospheric changes will not affect it.

The scale may be mounted by means of two studs screwed into bosses, as shown, and should be carefully marked, using draftsman's equipment. After inking in with waterproof ink the scale can be sprayed and made permanent with colorless lacquer.

The length of measuring cylinder will depend upon the shop and units to be charged. A 36 inch length appears ideal for general purposes.

Using Sight Charging Apparatus

The unit to be charged is hooked to the lower opening of the cross by means of a flexible charging line. Charging valve is left closed, but the vacuum valve is opened and the vacuum pump operated to remove all air or residual gases remaining in the unit or cylinder which is to be charged.

The outlet from the vacuum pump may be tied into the vent line leading to the open air. When the compound gauge indicates a deep vacuum the vacuum valve may be closed and the vacuum pump stopped.

Reference is then made to the height of liquid in the glass tube and calculations made to determine to what extent the level must be dropped to permit proper charging.

To charge the unit or cylinder the charg-

ing valve is opened. As soon as liquid has dropped to the predetermined point on the scale the charging valve is closed and the valve on the unit likewise shut. The small quantity of refrigerant remaining in the charging line can be driven over by use of a torch, prior to closing the unit valve. That gas remaining in the charging line can then be evacuated by opening the vacuum valve. In most cases it will be found unnecessary to operate the vacuum pump to effect clearance of the charging line.

Some operators prefer to fill the measuring cylinder to a certain definite mark only and to use this quantity for charging, dropping the level in the sight glass to zero each time, rather than to fill to any height and figure the charge from that point.

The main cylinder does not necessarily have to be suspended above the charging apparatus on this type, or any type having a vent valve, for that matter. The main refrigerant cylinder is inverted (valve down) and valve opened and left in this position.

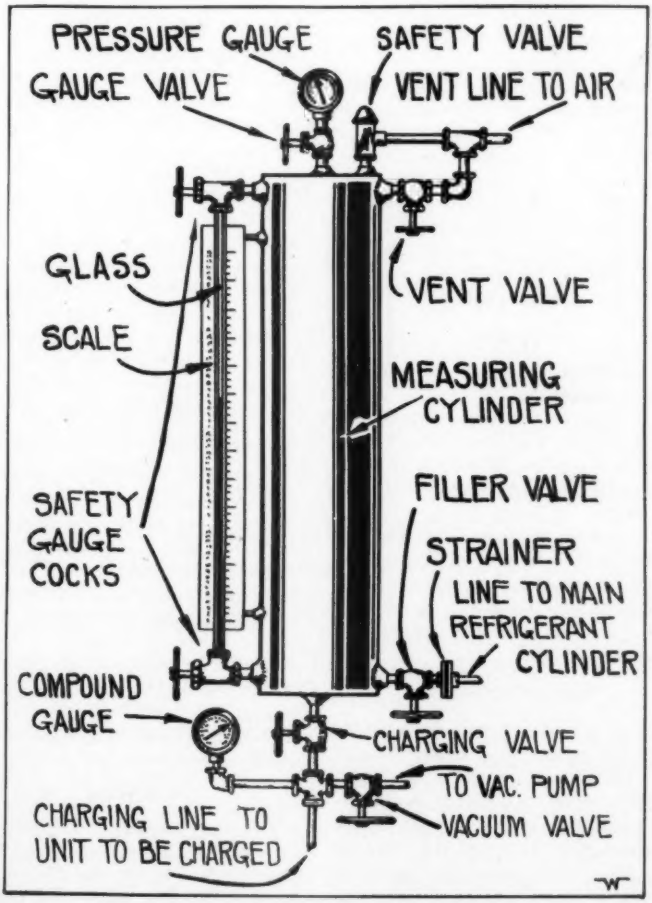

FIG. 4. SIGHT CHARGING APPARATUS

To fill the measuring cylinder, the filler valve is opened and the vent valve cracked a trifle. When level is at point desired the filler valve and vent valve are closed.

It is preferable to use a safety valve on any large measuring or holding cylinder. The spring loaded type of safety is made use of in most cases and should be piped to the vent line as shown.

All apparatus taking liquid refrigerant from a main cylinder should be provided with a strainer to remove dirt, rust and particles of thread compound which may be found in some refrigerant cylinders, regardless of the care exercised by some manufacturers in cleaning cylinders before filling for the trade.

The apparatus just described is best mounted on an oak board by means of straps. Have the scale so fixed as to be easily legible and so avoid error in reading it at an angle.

By having different scales available the apparatus can be quickly converted for use with other refrigerants or even used to measure oil charges. Be sure to thoroughly clean out the measuring cylinder before putting it into use with another refrigerant.

Conclusion

In conclusion it may be well to reiterate that the apparatus described in the preceding pages is suitable for shop work only, as it is of the non-portable variety. Such equipment will save considerable time in charging units or cylinders and requires but little space.

It is essential that correct refrigerant quantities be charged into small household equipment, especially some of the newer, high side float apparatus in which an ounce or two variance makes a noticeable difference in operating performance.

Factory Charging

The Ansul Chemical Company, manufacturers of refrigerant grade sulphur dioxide, advocate the following methods in charging units at the factory or assembly plant.

The successful operation of sulphur dioxide apparatus depends to a great extent upon the care used in preparing the system for the oil and refrigerant charge as well as the charging operation. The precautions and procedures which follow have been found necessary by many of the most successful manufacturers of sulphur dioxide systems. The instructions are very general, but with slight modifications, can be adapted to most of the modern refrigerating units.

It is assumed that the unit or evaporator has been completely assembled and is ready for the oil and refrigerant charge. During assembly the usual care is presumed to have been taken to see that all parts are clean, free from dirt, cutting oil, chips, compound, etc.

Preparing for Charge

The proper preparation of a unit or evaporator for charging involves the complete removal of all air and moisture that may be inside of the apparatus after assembly. This is best accomplished by means of heat and vacuum. The best method is to place the unit (without motor) in an oven heated to about 212° F. A tube connected to a vacuum pump is then secured to the liquid line, suction line or charging valve. A vacuum of at least 28″ should be maintained for two to four hours while the unit is at temperature. At the conclusion of the drying and evacuating period, the unit should be sealed off under vacuum and cooled. The evaporating unit is heated and evacuated in exactly the same manner.

Charging with Oil and Sulphur Dioxide

The unit to be charged is connected by a short piece of copper tubing or a flexible charging line to the charging board, as shown in Fig. 5. This apparatus is similar to the equipment previously described except an oil measuring cylinder is added and a mercury manometer used in place of a vacuum gauge.

Condensing units or high sides and complete assemblies are usually charged in the liquid receiver, via the liquid shut-off valve, while evaporators are charged through the gas or suction valve.

Evacuating Unit

The unit charging valve and the lower vacuum valve are opened, and a vacuum of less than $\frac{1}{10}$″ of mercury absolute is drawn on the unit. The vacuum line and manometer are then shut off.

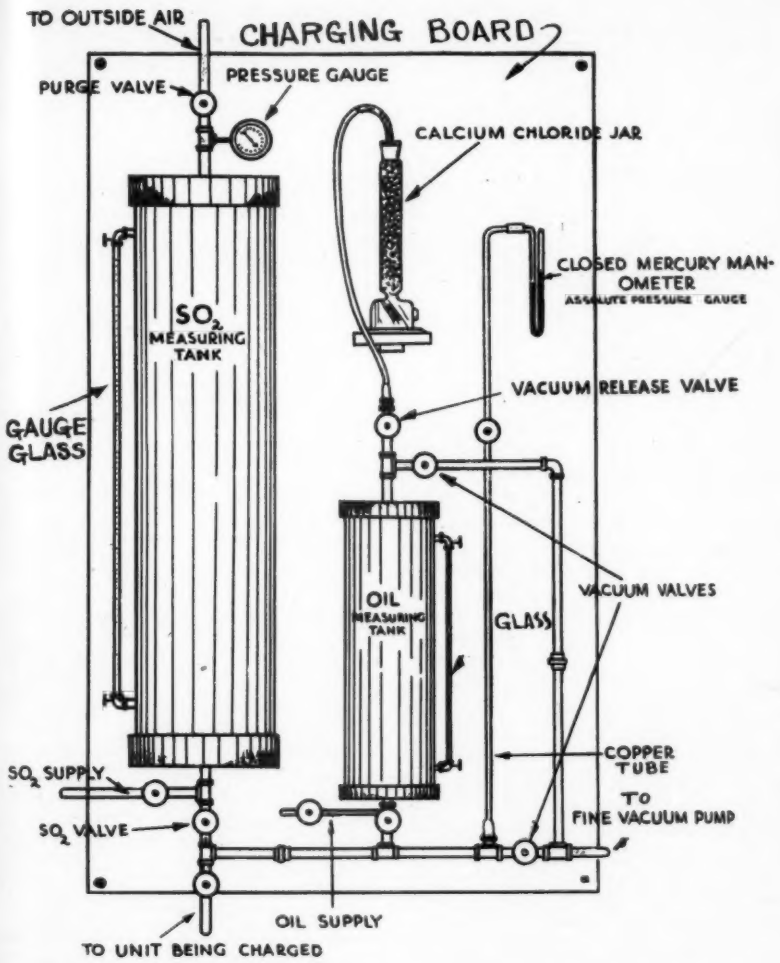

FIG. 5. UNIT FOR CHARGING REFRIGERATING MACHINERY WITH SO_2 AND OIL

Charging with Oil

By closing the vacuum release valve opening, opening the oil supply and both vacuum valves, oil is admitted to the oil measuring tank. When the oil has risen to a predetermined level, the supply and vacuum valves are shut off and dry air admitted by opening the vacuum release. The air is sucked through calcium chloride and dehydrated by this chemical compound. Oil is drawn into the unit by opening the valve under the measuring tank.

The measuring tank should never be completely emptied. In calibrating the tank it is best to set a lower or zero level near the bottom of the gauge glass and work upward from this point.

The oil must be dried before use by filter,

Cylinder Marking Data

Refrigerant	Inches, per				
	1/16 lb.	1/8 lb.	1/4 lb.	1/2 lb.	1 lb.
	1 oz.	2 oz.	4 oz.	8 oz.	16 oz.
Propane	.358	.716	1.432	2.864	5.728
Ammonia	.290	.580	1.160	2.320	4.640
Methyl Chloride	.194	.388	0.776	1.552	3.104
Sulphur Dioxide	.129	.258	0.516	1.032	2.064
Ethyl Chloride	.196	.392	0.784	1.568	3.136
F-12 (Freon)	.134	.268	0.536	1.072	2.144
Isobutane	.317	.634	1.268	2.536	5.072
Butane	.305	.610	1.220	2.440	4.880
Carbon Dioxide	.289	.578	1.156	2.312	4.624
Methyl Bromide	.105	.210	0.420	0.840	1.680
Methyl Formate	.180	.360	0.720	1.440	2.880

pressing through blotting paper or heat, or a combination of the two.

Charging with Sulphur Dioxide

The charge of suphur dioxide is drawn into the measuring tank by opening the SO_2 supply valve and barely cracking the purge valve on top of the measuring tank. When the sulphur dioxide has reached the upper level in the gauge glass, both valves are closed. The SO_2 valve to the unit is then opened and the liquid is drawn into the unit by the vacuum existing in it.

Frequently it is necessary to heat the supply tank with a small gas or gasoline torch to force the complete sulphur dioxide charge into the unit. (Be careful to keep the flame away from the gauge glass.)

When the charge has been introduced, the SO_2 valve is closed. The torch is passed slowly over the charging manifold and copper connecting tube or charging hose to drive all of the liquid into the unit.

Finally the unit charging valve and the lower valve on the charging valve are closed and the unit disconnected.

Basic Data

Refrigerant	Density @ 86° F. Lbs. per Cu. Ft.	Density @ 86° F. Ounces per Cu. In.	Ounces per Inch of Cylinder	Inches of Cylinder per OneOunce
Propane	30.37	.281	2.81	.358″
Ammonia	37.16	.344	3.44	.290″
Methyl Chloride	55.8	.516	5.16	.194″
Sulphur Dioxide	84.44	.782	7.82	.129″
Ethyl Chloride	54.88	.508	5.08	.196″
F-12 (Freon)	80.63	.746	7.46	.134″
Isobutane	34.10	.315	3.15	.317″
Butane	35.40	.327	3.27	.305″
Carbon Dioxide	37.41	.345	3.45	.289″
Methyl Bromide	102.94	.953	9.53	.105″
Methyl Formate	59.8	.554	5.54	.180″

In calibrating the sulphur dioxide measuring tank it is advisable to follow the same procedure as in the oil tank. Start with a lower or zero mark near the bottom of the gauge glass and calibrate upward from this point.

Check Weighing

A very convenient check of the proper charge may be obtained by weighing the complete unit on an accurate scale before and after charging. The increase in weight should be the sum of the oil and sulphur dioxide charges.

SEATTLE DEFEATS CODE FOR SERVICING

A BILL, which would require licenses for installers and service men, was presented to the City Council of Seattle, Wash., in July, and was intended to permit only qualified men to do this work. The bill was rejected by the Council.

The bill was principally sponsored by a small group of Seattle dealers, and some opposition developed from those dealers affiliated with national distributors, who felt that the bill as presented would not secure the benefits in proportion to the cost of licensing and bonds.

Some objection was made to several provisions of the bill, such as the Examining Board for the examination of servicemen which might be subject to political influence. The bill was proposed to serve as a regulatory measure because of several accidents which had occurred in the city during the past year.

The proposed licensing regulation, which was submitted and rejected, was as follows:

AN ORDINANCE regulating and licensing persons installing, altering, repairing, and servicing mechanical refrigerating systems and devices; defining offenses; prescribing penalties and amending Ordinance No. 48022 (the license code) by adding thereto ten (10) new sections numbered 306 to 315, inclusive.

Be it ordained by the city of Seattle as follows:

Section 1. That the License Code (Ordinance No. 48022) be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 306. Master Refrigerator Installer's License required . . . Fee: It shall be unlawful for any person to engage in, conduct, or carry on, the business of installing, altering, repairing or servicing mechanical refrigerating systems or devices of Class A, B, C, D, or E types, as defined in the "American Standard Safety Code for Mechanical Refrigeration" approved by the American Standards

Association, October, 1930, a copy of which is filed in the office of the City Comptroller and Ex-Officio City Clerk, bearing File No. 133,715, or to advertise or hold himself out as engaging in, or carrying on, such business without first having obtained and being the holder of a valid and subsisting license so to do, to be known as a "Master Refrigerator Installer's License," the fee for which is hereby fixed in the sum of $25 per annum. Said license shall be posted and conspicuously displayed in the office or regular place of business of the holder thereof, or if no regular place of business be maintained, shall be carried on the person of the holder thereof (during business hours) or while business is being carried on and be displayed at the request of any interested person.

Section 2. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 307. Refrigerator Installer's license required . . . Fee: No person whether licensed as a Master Refrigerator Installer or not, shall, as an artisan, workman or employee, install, alter, repair or service any such mechanical refrigerating system or device or perform work thereon, without being the holder of a valid and subsisting license so to do to be known as a "Refrigerator Installer's License" the fee for which is hereby fixed in the sum of $2.00 per annum.

Section 3. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 308. Certificates of Competency—Examinations Therefor: No Refrigerator Installer's License shall be issued until the applicant therefor shall have successfully passed an examination given and conducted by, and received a certificate of competency from, the Examining Board hereafter created. Such examination shall be of a character which will thoroughly test, and such certificate of competency shall certify, the applicant's ability, competency and qualifications to install, alter, repair, and service mechanical refrigeration systems or devices of Class A, B, C, D, and E Types (1) which use high pressure refrigerants of 125 lbs. or above, or (2) which use low pressure refrigerants below 125 lbs., or the applicant's ability to install, alter, repair, and service each of such systems.

Section 4. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 309. Examining Board: There is hereby created an Examining Board to pass upon, and to issue certificates of competency of, the qualifications and competency of all applicants for Refrigerator Installer's Licenses required by this ordinance. Said Board shall consist of the Commissioner of Health, the Chief Plumbing Inspector, and the Chief Examiner of the Civil Service Commission, who shall act in such capacity ex-officio. The Chief Examiner of the Civil Service Commission shall act as Secretary of the Board, but shall receive no compensation as such.

Said Board shall within 30 days after the effective date of this ordinance meet, organize and select a chairman and designate the time and place of the first examination of all pending applications for licenses. Further examinations shall be held from time to time as the Board shall determine but no applicant for a license shall be required to wait for an examination for more than 30 days after filing his application with the Examining Board. The Board shall keep and preserve a record of all persons examined by them and shall issue to those successfully passing such examination certificates of competency stating the qualifications and competency of the persons examined.

Section 5. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 310. Advisory Committee: The mayor shall within 30 days after the effective date of this ordinance and from time to time thereafter as may be necessary, designate an Advisory Committee to the Examining Board to consist of one person who is either a manufacturer of mechanical refrigerating systems or devices or an agent or employee of such manufacturer, and one person who for not less than five years immediately preceding the date of his appointment has been engaged in the actual work of installing, repairing, altering and servicing mechanical refrigerating systems. The Advisory Committee shall upon request of the Examining Board consult with such Board and assist in the examination and rating of applicants for the license required by Section 308 of this ordinance but shall receive no compensation for their services while acting in such capacity.

Section 6. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 311. Application for Examination and Certificate of Competency: Any person desiring an examination for a Certificate of Competency shall make written application therefor to the Examining Board upon a form to be furnished by said Board for that purpose. Such application shall state the name, age, address, and pertinent experience of the applicant and such other information as the Board may require.

Section 7. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 312. Application for License: Any person desiring any license required by this ordinance shall make written application therefor to the City Comptroller upon a form to be furnished by him for that purpose. Such application shall state the name or names and address or addresses of the person, members of the firm or partnership or officers of the corporation for whom a license is sought and the address at or from which the holder of such license will carry on business. Application for license shall be accompanied by receipt signed by, and showing payment to, the City Treasurer of the sum of $25 if for a Master Refrigerator Installer's License or of the sum of $2.00 if for a Refrigerator Installer's License, which payment shall, if the license be issued, be applied on the fee chargeable for the first annual license. If such application be for a Refrigerator Installer's license it shall be accompanied by the applicant's certificate of competency. If satisfied that the applicant has complied with the requirements of this ordinance, the City Comptroller shall issue the license applied for for a period of one (1) year from the date of issue and may renew the same annually upon a like application and payment to the City Treasurer of the fee required as in the case of the original application.

The Examining Board may require the holder of any Refrigerator Installer's License to take a further examination at any time to test the qualifications of the holder thereof, or may suspend for incompetency any license for a definite period or revoke or cancel the same, after public hearing, based upon written charges prepared and served by the Board on the licensee, and any license may be suspended or revoked by the City Council as provided by Section 14 of the License Code (Ordinance No. 48022).

Section 8. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 313. Master Refrigerator Installer's Bond: No Master Refrigerator Installer's License shall be granted until the applicant therefor shall have furnished a good and sufficient bond in the penal sum of $600, executed by the applicant for such license, as principal, and by a surety company authorized to do business as such in the State of Washington, as surety, approved as to sufficiency of surety by the Mayor and City Comptroller and as to form by the Corporate Counsel and conditioned:

(a) That the principal will abide by the terms of this ordinance and all ordinances relating to installing, altering, repairing or servicing mechanical refrigeration systems and devices:

(b) To save harmless and indemnify the City of Seattle from any and all loss, damages, actions and

claims of any kind or character which may accrue to or be suffered by any person by reason of failure of the principal, his servants and agents, to abide by the terms of this ordinance and all ordinances relating to installing, altering, repairing or servicing mechanical refrigerating systems or devices:

(c) To save harmless and indemnify the City of Seattle and any and all persons for any and all loss or damage of any kind or character which may be suffered by them by reason of, or resulting from the failure or neglect of the principal, his servants and agents, to abide by the terms of this ordinance and all ordinances relating to installing, altering, repairing or servicing mechanical refrigerating systems or devices: Provided, that the liability of any surety hereunder shall not extend to claims for labor or material incurred by any principal:

(d) That the obligations of said bond shall not be terminated before 60 days from the date of written notice by the surety thereon of such termination to the City Comptroller of the City of Seattle:

(e) The liability of the surety upon this bond shall be limited to the amount specified in the bond, and in case of recoveries had by two or more persons for the violation of conditions of said bond in excess of the amount of the bond, such recoveries shall be prorated and the total recovery as against the surety shall not exceed the amount of the bond:

In the event such bond or the coverage thereof be terminated or impaired by notice of termination, expiration, or the attaching of any liability thereon, or otherwise, any license granted under Section 1 hereof shall be suspended until such time as an additional bond, or bonds, be furnished and maintained in the full, unimpaired penal sum of $600.

Section 9. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 314. License not required for period of 90 days: Any person installing, altering, repairing or servicing, or engaged in, conducting or carrying on, the business of installing, altering, repairing or servicing mechanical refrigerating systems or devices at the time this ordinance takes effect shall be allowed to continue so to do without a license for a period of 90 days after the effective date of this ordinance; Provided, that any such person shall within 60 days after the effective date himself make application to the City Comptroller for a license hereunder; and as to such applicants, the Examining Board shall, within 90 days after the effective date of this ordinance, conduct examinations and pass upon the qualifications and competency of such applicants and report the result of such examination and its recommendations as to those entitled to licenses to the City Comptroller, who shall issue the licenses to the applicants in accordance with the recommendations of the Examining Board.

Section 10. That said License Code be, and the same hereby is, amended by adding thereto a new section to read as follows:

Section 315. Penalty: Any person violating or failing to comply with any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and upon conviction therefor, shall be punished by a fine in any sum not exceeding $300, or by imprisonment in the City Jail for a period not exceeding 90 days, or by both such fine and imprisonment.

? ? ?

water supply in the case of the water-cooled machines. With natural gas, especially, there may be some difficulty due to the burner becoming plugged so that the flame is not at the normal intensity.

The Electrolux machines require a certain amount of heat and, if the flame is turned too high, the amount of refrigeration will be increased and, if the flame is too low, the refrigeration will be decreased.

It will be well to check the water supply to insure that a sufficient quantity of water passes through the system. Some of these machines had a water valve which may have become clogged and caused some trouble.

SERVEL

QUESTION 154. *I am writing to you for advice on a service problem on a 1927 Servel household refrigerator.*

Originally it was a CH_3CL *high-side float job with a pressure switch mounted on and directly actuated by the float mechanism. It has a twin cylinder compressor, ¼-hp. motor and the evaporator is of the congealing tank type containing an alcohol and water solution. Outside dimensions of the evaporator are 24" x 12" x 12". The cabinet is 14.4 cu. ft. gross capacity and has four doors. The condenser consists of approximately 60 ft. of ⅜ copper tubing, finless and air cooled.*

When I arrived on the job I found that a previous service man had removed the entire high-side float mechanism, including the pressure switch and float chamber, and had installed a "Fedders" constant pressure valve and "Tag" thermostat and evidently intended it to run as dry CH_3CL *system, as there was no receiver.*

The box had been shut down for about eight months, so I first made an observation run and found a shot compressor and that the charge had leaked out due to a leaking seal.

I removed the compressor and overhauled it; also flushed out the condenser with CCL_4 *and thoroughly hydrated it. Removed the evaporator, as it had a leak, which I repaired. In cleaning out the evaporator, was surprised to find that about a pint of oil was in it. This ran out of the suction and liquid connections, so I suspected that there might be some kind of a pocket constructed in it. Is there?*

Before reassembling I decided to convert it to a thermo-expansion job, as I don't believe I could have it as I found it. So have installed a No. 822 American Injector thermo-valve, a 90-cu. in. receiver and a KR-500 Ranco pressurestat. Also have replaced all tubing.

From the size of the receiver, length of liquid line (8 ft. ¼ inch tubing), suction line (10 ft. ⅜ inch tubing) and size of condenser, etc., I figured a 3 lb. charge of CH_3CL *was about right, but with this charge could get only a hiss and very little frost at the expansion valve. So added in ¼ lb. charges 2 lbs. more before the valve started to gurgle and a good frost appeared. I cannot understand why this system should take such a charge. What do you figure as a correct charge?*

When I installed the compressor I filled it with oil to the level of the filler plug, but after running a short time found that the oil in the crankcase was low and not being returned to the crankcase. Is it possible that it was being trapped in the evaporator? I added about 2 oz. more oil, but am afraid to add more, as since I've added the oil the operating head pressure is 105 lbs. and the shut-down pressure is 65 lbs. The room temperature is about 65° F.

Have checked all connections with soap and water and a Halide detector and have purged repeatedly but cannot bring the pressure down. Can you give me an idea of what can be keeping the head pressure up?

I have set the thermo-valve and pressurestat for 10 lbs. C.O. and 20 lbs. C.I. Is this okay?

To summarize the questions, I would like answered:

1. *Correct amount of charge.*
2. *Correct charge of oil.*
3. *What is holding head pressure up?*
4. *What should operating and shut-down pressures be?*
5. *Is pressure and thermo setting okay?*
6. *Is there any way of altering the evaporator to improve oil return?*

The refrigerator is operating now and, while the temperatures are fair, it is very erratic in cycling.

ANSWER: The evaporator in the Servel refrigerator which you refer to consists in a brine tank with a coil of tubing contained in the tank which connects to an accumulator tank on the inside of a brine tank whose outlet goes to the suction side of a compressor and it is out of this accumulator tank that you drained the oil.

The charge of refrigerant required for one of these evaporators with the accumulator tank is just about 8 pounds of methyl chloride and, if a thermostatic expansion valve is to be used, it may be that slightly more than this amount will be required in order to carry a reserve in the receiver, which in this case is the bottom part of the condenser coil and to have a sufficient amount in the evaporator to fill both the evaporator tube and the accumulator cylinder in the brine tank.

I will answer your questions as follows:

The charge of refrigerant required used with a thermostatic expansion valve would probably be about four pounds of methyl chloride. This charge, however, will be so great that it will probably be impossible to pump the system down, as the condenser tube acting as a receiver may not have sufficient capacity to hold the full charge. In all probability it would be advisable to use a temperature control and an automatic expansion valve with the bulb clamped to the brine tank or dropped into the brine. In this case, three pounds of refrigerant would be sufficient and the condenser would have sufficient capacity so that the charge might be pumped down.

One and one-half pints of oil should be sufficient for this compressor. I would say that your head pressure is not too high. We find that quite often the head pressure on a methyl chloride machine may go as high as 120 pounds, especially when the suction pressure is quite high. I would say that with this type of machine, if the head pressure is maintained between 80 and 120 pounds, depending on the temperature of the room, that there is nothing to worry about from this score. The shut-down pressure, of course, should depend on the temperature of the condenser coil and may be checked by referring to a table showing the pressure temperature relations of the methyl chloride. I would suggest a pressure setting of six or eight pounds to twenty pounds.

There should be no difficulty in oil return if sufficient refrigerant is used.

SERVEL

QUESTION 155. *About three weeks ago, I had a call to service a Servel 87-36807. I found the machine to be stopped with a gauge reading of 9 lbs. By pushing contacts together in pressure switch, the machine ran for a few seconds and stopped. By holding contacts together till a gauge reading of 0 was reached, the pressure went up to normal and has been running fine till this morning, when the same trouble was found.*

There is a piece of casting to the left of the compressor that looks like a figure 8 from the top. Is there a float in there that would stick? I don't like to take anything apart unless I am sure.

ANSWER: The trouble with the Servel machine which you describe, I would say, is undoubtedly a case of air in the high side float valve or a case of having the high side float valve in a place where its temperature is inclined to be higher than the temperature of the condensing unit. If it is a case of air in the high side float valve, the air may be purged out by loosening the plug in the top of the valve. In any case, this will cause the machine to start operation.

The explanation of your trouble is simply that the high side float valve is not filling with liquid and consequently does not open the float valve. It may fail to fill with liquid due to having air in the system which gets into the high side float chamber, and due to its pressure, keeps the refrigerant liquid from entering the float chamber.

If the temperature of the float chamber is higher than that of the condensing unit, the liquid of course will stay in the cooler part of the system, which in this case would be the receiver or condenser, and the float valve, not filling with liquid, would not open. When you hold the control closed for some time, you may pump sufficient refrigerant into the condenser receiver so as to raise the head pressure sufficiently to cause the liquid to be forced into the float chamber, opening the valve and starting operations.

The casting which you refer to that looks

like a figure 8 from the top is the float chamber.

CHARGE FOR WATER-COOLED UNITS

QUESTION 156. *How about the proper charge for water-cooled units and the oil-bound float? I would also like to know some other things:*

How many square feet of tubing will produce a certain condition, or remove a certain number of B.t.u.'s?

How do I calculate the number of gallons of water which will pass through a refrigeration system that has a water-cooled head and a water-cooled condenser, or just a water-cooled condenser?

Does the needle on a thermostatic bulb close before the compressor shuts off?

ANSWER: I will divide your question into several parts.

With respect to the proper charge for water-cooled units, the charge is the same as for air-cooled units; that is, sufficient liquid in the receiver to be sure that the tube passing to the liquid line is covered with liquid at all times. This applies to any type of system except those making use of high side float valve or capillary tubes.

The best method of taking care of oil-bound floats, in my experience, has been to pump as much refrigerant out of them as possible, remove the float valve and pour the oil out, then replace.

The trouble of oil binding in float valves may be eliminated or minimized to a great extent by installing an oil trap between the compressor and condenser which will return the oil to the compressor rather than let it pass with the refrigerant into the evaporators. A float which gives considerable trouble in one particular location may be corrected quite well by putting ebulators in the tubes which come into the header of the evaporator. These ebulators may consist of flat strips of metal which may be pushed down inside the tubes.

With respect to the amount of tubing required to remove a certain number of B.t.u's, in general with a natural convection circulation of air by the refrigeration tubing, approximately two B.t.u's will be picked up per hour per square foot of tube surface per degree of temperature difference between the tube and the air passing over the tube. For tubing in water, the rate of heat transfer is considerably faster, and if the water is agitated, the rate of heat transfer is still further increased. The rate of heat transfer is also increased if a forced circulation of air passes over the tube.

The number of gallons of water which will pass through a refrigerating system for condensing purposes may be calculated by multiplying the number of pounds of refrigerant which are to be circulated per hour by the difference in heat content of the refrigerant as it enters the condenser in a super-heated state and the heat content of the liquid leaving the condenser, and then dividing the above quantity by the difference in temperature between the water entering the condenser and the water leaving the condenser, times 8⅓. In other words, we find the amount of heat that is being taken out of the refrigerant per hour and divide that by the difference in temperature in the water, which will give us the number of pounds of water used per hour; and this divided by 8⅓ will give us the number of gallons of water per hour. For a rough estimate, the amount of heat which will pass into the water in the condenser may be approximately 120% of the amount of heat which the refrigerant picks up in the evaporator; so that if you know how much refrigeration you are doing in B.t.u's per hour, you can multiply this by 1.2 and divide this quantity by the temperature difference in the water, times 8⅓.

With respect to the operation of a thermostatic expansion valve, the needle of the valve simply throttles the refrigerant through to maintain a constant amount of super-heat at the thermostatic bulb; and the needle does not close off until after the refrigerating machine has stopped and the pressure in the evaporator builds up so as to work on the bellows or diaphragm in the valve itself to close the needle.

The opening of the needle is governed by a balance which obtains between the force exerted by the bellows of the power element and the force exerted by the bellows of the expansion valve due to the outlet pressure of the valve. As the temperature of the thermostatic bulb decreases, the valve throt-

(Continued on page 52)

Shop Service and Rebuilding General Electric Hermetic Units

FOURTH ARTICLE (Concluded)

In This Article the Author Concludes His Instructions on Shop Service of the G.E. Hermetic with Data on the Various Models.

By EDWARD GEISER

ONE of the most difficult problems that the shop man is faced with, and one of the things which has caused numerous concerns to quit rebuilding this type of hermetic is the lint on motor windings. As enameled wire cannot be used in motor winding due to action of SO_2, extra insulation is necessary. Many kinds have been tried, but most types have lint which is washed off by the action of the oil and eventually clogs the screen. It is of paramount importance that all lint be removed from windings, and this can best be accomplished as follows:

Construct small circular burner approximately three inches inside diameter. Construct small gas jet line of 3/16-inch tubing so that it will form jet into larger tubing. A burner should be made of ½-inch tubing. Adjust jet at end of tubing so that sufficient air is taken in with gas to obtain a blue flame. Pass wire through ring of flame, unreeling wire from one spool to another. As wire passes through, the flame should be neither too slow or too fast, and the operator should watch wire after leaving flame to determine speed at which he should operate this apparatus. After motor has been wound, singe off from outside any lint that has been raised by handling.

Reassembly

When assembling rebuilt units, it is convenient to set them upside down to work on. However, the oil will enter the condenser lines where it will flow into the float and be pumped out during dehydration. Before unit is set in an upright position, lay unit on side and with air pressure force oil back into dome.

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Dehydrating

As the problem of dehydration in this particular type of unit is of great importance, it is suggested that the shop build or obtain an oven capable of producing at least 240° of heat, and a vacuum pump which will draw not less than 26 inches of vacuum gauge pressure. In addition, it will be found necessary to supply heat internally. This may be done as follows: When alternating current is supplied through running and common lead, and the motor is not running, heat is created by magnetic induction. A simple apparatus for supplying the correct amount of current is shown in Fig. 12.

Considering 110 volts A. C. as the basic current, apply 6½ amperes for three minutes, reducing current to three amperes for three minutes. Then, reduce voltage to 1½ amperes for six hours. The above current to be applied after maximum vacuum only has been obtained on unit. *Caution: Be sure to follow above closely, as motor windings may be damaged if current is applied too strong.*

Test Dome

On the welded type units, because of the expense involved, it is advisable for the shop to build a test dome under which compressor efficiency may be tested under maximum conditions. Test dome may be built as follows: Obtain welded steel pipe and weld plate over one end. Machine other end for gasket and weld bolts at two inch intervals. Drill holes accordingly in square plate which can be bolted on. All material used should stand a working pressure with a limit not less than 250 lbs. per square inch. Then drill and tap 4¼ S. A. E. by 1¼-inch pipe fittings, one to extend inside so that line attached to suction line may be flare fitted

to it. This will enable shop man to check low-side with full 150 lbs. pressure on high-side. Machine should pump not less than 26 inches of vacuum with full head pressure. Drill and tap for three spark plugs or any other means than can be used for insulated terminals.

Testing Float

To test float, close with flare block and yoke the sawed end of condenser line and using a service valve, operate float using air check for purge. Release flare block and blow back through condenser line from float to clean screen.

If float is found to be leaky or blocked (on burned out motor jobs it is always advisable to open float) it is desirable to open it for repair. If float is of welded type, chuck it in lathe and cut from bead the same as opening welding unit. The cap or dome of float fits over base in same manner. Tap gently to dislodge. Dismantle float, remove needle and file seat at right angles to center line of needle. Do not remove more than necessary. Tap needle point into lead bar and with compound, lap new surface. Reassemble to base and place air on outlet side (liquid line), and test for leakage with oil by resting float ball on arm in normal position. If still leaky, tap needle to seat it.

Assemble float making sure rod is not bent, and it is possible that due to lowering of seat and shortening of needle, float ball will not hit on needle guide. If this is the trouble, grind off needle, guide and adjust. New needles are made slightly longer for this purpose. When assembling float, do not force base on any farther than original position, as this will distort the guide pin in center, when float is placed in closed position. Mark float for reassembly when cut open, then weld back together and test for operation and leak.

Replacing Liquid Line

In many cases, it is desirable to replace new liquid line. If so, drill out old one, but do not drill in more than ⅜-inch. Insert tubing and silver solder and then place short nipple of swedged ½-inch tubing about ¾-inch long over line and fill with common solder. The purpose of the sleeve is to seal the joint better. Test carefully for leaks when finished.

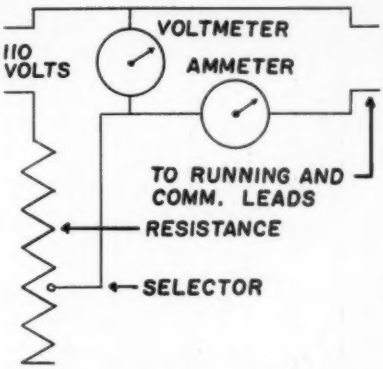


FIG. 12—SIMPLE APPARATUS FOR DEHYDRATING INTERNALLY

On some older models, the float is bolted on base. If so, remove base and proceed as above. Also, there are some floats crimped on base and soldered. These look like bolted bases without holes. Cut through solder and drive base off. It is best to spot weld or braze these floats before solder sealing, as they are liable to force off under pressure if sealed with solder only.

Later models have a tube extending from the float through insulation, and needle is operated with an arm, and the seat is located approximately ¾-inch from bottom of this tube. The purpose is to prevent moisture into insulation. From back of float, new seat can be obtained with same type of tool used on low-side check. *Caution: Do not saw this tube.*

Use Silver Solder

Silver solder should be used on all joints possible as this eliminates vibration breaks and leaks. It is easy to use, makes a very good joint, and is no more expensive than other solder, as it saves much in time and breakage. "Easy-flow" is recommended as it melts and works at 1175° F., well below others.

The following tables give refrigerant and lubrication data as well as windings for motors.

Oil and Refrigerant Data

Model	Type	H. P.	Oil Cap.	SO_2 Cap.	
D. R. 1	A	1/10	1¼ qt.	3¾ lbs.	In later models 4 lbs. SO_2
	B	1/10	1¼ qt.	3¾ lbs.	
D. R. 2	E	1/8	1½ qt.	5¾ lbs.	Due to forming of evaporator some models require more, possibly an additional pound to properly frost coils. This can only be determined by checking individual machines.
	D	1/8	1½ qt.	5¾ lbs.	
	F	1/8	1½ qt.	5¾ lbs.	
	A2	1/8	1½ qt.	5¾ lbs.	
D. R. 3	Stand	1/6	1½ qt.	12 lbs. double evaporator. 8 lbs. single evaporator. Water cooler 6 lbs.	This model offered with several special types of coils. Capacity can be obtained from name plate on specials.
D. R. 4	Comm.	1/3	3 qt.	12 lbs.	Found in many special types. Check frost back for capacity.
	Water cooler	1/4	3 qt.		
	box	1/3	3 qt.		
D. R. 5	Comm.	1/2	5½ qt.	20 lbs.	This is also offered with porcelain evaporator. This unit is a 220 volt machine.

On all models check frost back on suction line, especially on brine tanks, which due to their performance of the double shell require varying amounts for proper charging. Oil recommended is No. 300 Viscosity Argon oil. Do not use pale oils.

Windings for Motor Data

D. R. 1—1/10 hp., 8½ lb. core (iron), No. 24 wire starting, No. 19 wire running, 110 volt A. C.

STARTING WINDING SPAN	RUNNING WINDING SPAN
1-8-27 turns	1-8-50 turns
1-6-23 turns	1-6-37 turns
1-4-18 turns	1-4-35 turns

D. R. 2—⅛ hp., 10 lb. 5 oz. core (iron), No. 22 wire starting, No. 19 running, 110 volt A. C. EARLY MODEL.

STARTING WINDING SPAN	RUNNING WINDING SPAN
1-8-26 turns	1-8-41 turns
1-6-22 turns	1-6-28 turns
1-4-20 turns	1-4-28 turns

D. R. 2—⅛ hp., 10 lb. 5 oz. core (iron), No. 22 starting, No. 18 running, 110 volt A. C. LATE MODELS.

STARTING WINDING SPAN	RUNNING WINDING SPAN
1-8-26 turns	1-8-41 turns
1-6-22 turns	1-6-30 turns
1-4-18 turns	1-4-26 turns

D. R. 3—1/6 hp., 10 lb. 5 oz. core (iron), No. 22 wire starting, No. 18 running capacitor start 110 volt A. C.

STARTING WINDING SPAN	RUNNING WINDING SPAN
1-8-34 turns	1-8-41 turns
1-6-26 turns	1-6-32 turns
1-4-19 turns	1-4-29 turns

D. R. 5—½ hp., 220 volt A. C. capacitor start wire (iron), No. 23 starting wire, No. 19 running wire.

VARIABLE GROUP WINDING

RUNNING WINDING SPAN	RUNNING WINDING SPAN
1-10-49 turns	1-9-38 turns
1- 8-45 turns	1-7-30 turns
1- 6-38 turns	1-5-25 turns
1- 4-25 turns	1-3-11 turns

STARTING WINDING SPAN

1-8-45 turns
1-6-38 turns
1-4-25 turns

Motor winding data for D. R. 4 is not given so as to avoid confusion as this model is built with ¼ and ⅓ H.P. windings and from all appearances both windings are identical, and to prevent winding the field wrong the writer suggests that winder make out new span copy for each individual winding.

All wire used should be double cotton covered long staple purified wire without enamel. The winding should not be roughed more than necessary, and windings should be securely anchored in place with bone fiber wedges. *Caution:* If windings are not tight vibration will loosen winding which will drop and rub on housing and cause it to short.

All motors should be subjected to 1000 volts minimum at ¼ amp. to ground. Also another good vibration test to make is to mount motor by collar and suspend loosely a rotor that has been removed from shaft. Apply 25 volts through starting, running, and common and attach on side of voltage to common and other lead to starting and running leads which have been twisted together.

The above test will cause rotor to vibrate against field, and if there is any poorly insulated portion of winding that will short due to vibration, this test will show it. Only alternating current may be used, and test should be made in conjunction with a volt meter. A sharp rise in voltage scale will indicate defective winding.

X X X

R. Altman, Alabama

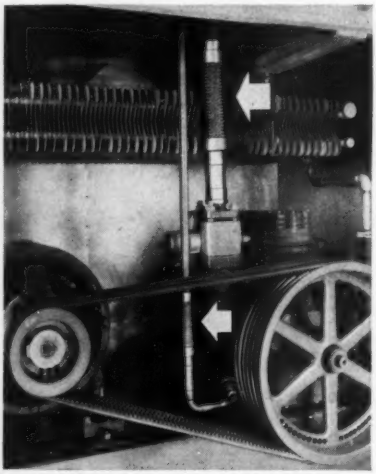
I get valuable information from each issue of the R. S. E.

NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

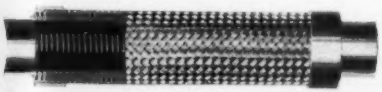
VIBRATION ABSORBERS

REX-WELD Vibration Absorber is the trade name of the unit manufactured by the Chicago Tubing & Braiding Co., to eliminate vibration and dampen noise set up by refrigeration equipment.



VIBRATION ABSORBERS ON EQUIPMENT

A unique feature of the Rex-Weld construction is that it has a remarkable resistance to fatigue under constant flexing and vibration, and its closely knit non-porous structure, which prevents the escape of even the most searching fluids and gases. Rex-Weld vibration absorbers are complete units, which can be installed quickly and easily.



CONSTRUCTION OF VIBRATION ABSORBER

The fittings are standard attached by brazing, and will remain unaffected by any subsequent heat applied in sweating into the copper tube line.

The company has also introduced a flexible all-metal charging hose, built to with-

CHARGING HOSE AND FITTINGS

stand pressures up to 2000 lbs., and is non-corrosive and non-crystallizing. The hose is constructed by exclusive patented welding process, in which strip metal is formed into annular or circular corrugations, producing an all-metal tubing of convenient flexibility, and then over this construction, is woven a special braided jacket, which prevents stretching and reenforces the tubing against bursting stress.

* * *

Q. A. SHAFT SHOE

A SIMPLE device for refacing the compressor shaft shoulder without relapping or removal of shaft, which is called the Q. A. Shaft Shoe, is being manufactured by Colman J. Mullin, 50 Church St., New York City, who specializes in replacement parts for compressors.

Primarily, the purpose of the shaft shoe is to make a satisfactory replacement of the ground and lapped surface on the shoulder of the shaft of a compressor, pump, etc.

(Continued on Page 58)

The REFRIGERATION SERVICE ENGINEER

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

CONVENTIONS

ON November 11, the 3rd Annual Convention of the Refrigeration Service Engineers' Society will convene in Memphis. Although this is the 3rd Annual Convention, it will be only the second meeting at which a manufacturers' exhibit has been held in connection with the meeting. Some forty manufacturers are participating in the exhibit, which from an educational and informative standpoint, represents an important feature of the three-day meeting.

Trade expositions are a good barometer of the progress of the industry. This convention of service engineers, from all reports, will be a most definite indication of the advancement and position that the business of installation and servicing occupies in the industry today.

The Society invites the attendance of all identified with the industry to be present in Memphis, November 11-13.

"FOR RENT— AIR-CONDITIONED"

A RATHER interesting discussion on what advancement air-conditioning for residential purposes could be expected to make during the coming year took place among several well-informed engineers, who have been close to air-conditioning trends. They maintained that shortly we may witness signs on vacant apartments—"For Rent—Air-Conditioned"—in the same manner that only a few years ago, properties seemed to have a greater appeal if the advertisement specifically stated — "Electric Refrigeration."

Just what would this air-conditioning system comprise? Would it be a central system with individual control for each apartment, and what would the increase in rent for such an apartment be?

The opinion was that the first move in this direction would probably provide for a portable room cooler, which could be moved conveniently about the house. While this might be a far cry from complete air conditioning, nevertheless, it would have a definite appeal in apartment renting. It has been tried out this year with success, and indicates a move that may assume impressive proportions within the next few years.

The point of interest to our field is that in such developments, it places another refrigerating machine in the household which we must reasonably expect will require service attention. It may not be far distant when the housewife in calling the refrigeration service shop will say, "My refrigerator is operating satisfactorily, but our air-conditioning plant requires some attention."

WINTER CHECK-UP

EVERY service engineer and service organization is well acquainted with those small commercial jobs that could stand a complete overhaul. This information has naturally been gained through contact with many of these jobs during the past summer months.

Now is the opportune time to do a constructive selling job in getting these customers to consider the advantages of overhauling during winter months when a thorough job can be undertaken with the least inconvenience. There is some real work to be done, and it certainly can be handled more profitably during the winter season.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Memphis Awaits You
For the Third Annual Convention
Refrigeration Service Engineers' Society
Hotel Gayoso, November 11-12-13

ALL is in readiness for your visit to Memphis. Consider this a personal and cordial invitation to be present in the "City of Southern Hospitality" on November 11, 12 and 13. The event—the 3rd Annual Convention and Manufacturers' Exhibit of the Refrigeration Service Engineers' Society—three days packed with educational and entertainment features. Every service man is invited to attend, whether a member or not.

All plans have been completed. The convention committee has wound up the final details, and Memphis awaits your visit. Memphis local convention committees have been busy since last year when they were awarded the convention for 1936. The committees' activities will culminate with the holding of the convention. No stone has been left unturned to provide a full program of three days' activity. Memphis promises to make your visit a memorable and pleasant one.

The Educational Program

The educational part of the program is one of importance to every service engineer interested in his advancement in the business. The program will express the opinions and viewpoints of leaders in their particular fields, who have been assigned subjects of widespread interest. Some of the more important subjects that will be discussed will include:

Lubricating Oils

First Aid When Overcome by Gas

The Use of Various Neutralizers for Refrigeration Gases When Purging, and the Use of Neutralizers in the System

Unit or Forced Draft Coolers—Where to Use Them and Specific Examples of How to Figure

Conversion of Flat Belt Drives to V-Belt Drives

How to Figure Proper Compressor Capacities for Various Applications

(Continued on page 35)

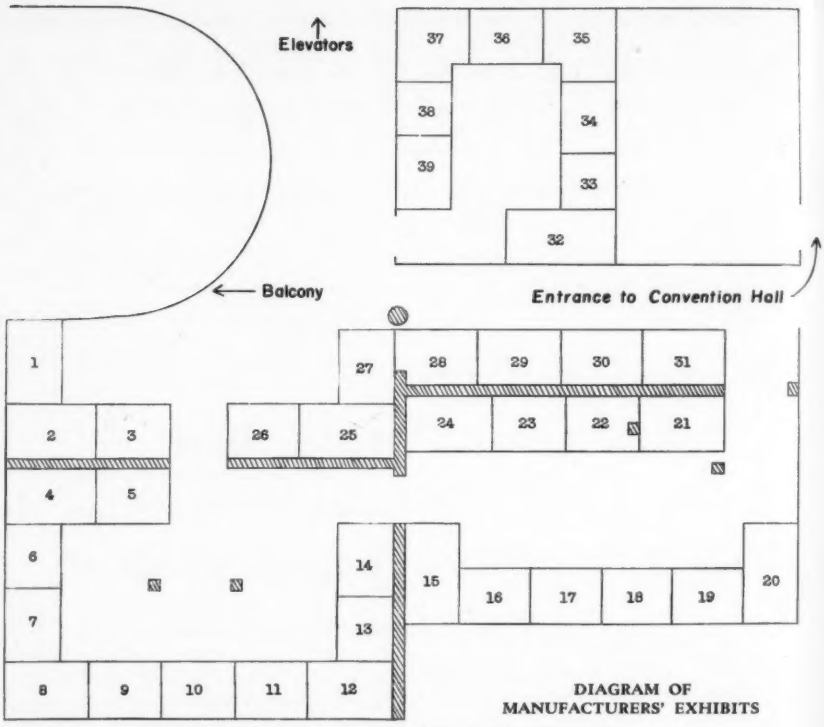


DIAGRAM OF MANUFACTURERS' EXHIBITS

Exhibitors and Space R. S. E. S. Convention

1 Feeders Mfg. Co., Inc., Buffalo, N. Y.
2 Kellogg Compressor & Mfg. Corp., Rochester, N. Y.
3 Ranco Inc., Columbus, Ohio
4 Penn Electric Switch Co., Des Moines, Iowa
5 The Starr Co., Richmond, Ind.
6 Standard Refn. Parts Co., Chicago, Ill.
7 L. H. Gilmer Co., Philadelphia, Pa.
8 Peerless Ice Machine Co., Chicago, Ill.
9 Automatic Products Co., Milwaukee, Wis.
10 Ansul Chemical Co., Marinette, Wis.
11 Mills Novelty Co., Chicago, Ill.
12 Henry Valve Co., Chicago, Ill.
13 Airo Supply Co., Chicago, Ill.
14 Mueller Brass Co., Port Huron, Mich.
15 and 16 Virginia Smelting Co., West Norfolk, Va.
17 Wolverine Tube Co., Detroit, Mich.
18 Alco Valve Co., Inc., St. Louis, Mo.
19 Curtis Refrig. Machine Co., St. Louis, Mo.
20 Frigidaire Corp., Dayton, Ohio
21 Detroit Lubricator Co., Detroit, Mich.
22 R & H Chemicals Dept., Wilmington, Dela.
23 and 24 Imperial Brass Mfg. Co., Chicago, Ill.
25 Tecumseh Products Co., Tecumseh, Mich.
26 Cutler-Hammer Co., Milwaukee, Wis.
27 Dole Refrigerating Co., Chicago
28 Kerotest Mfg. Co., Pittsburgh, Pa.
29 Perfection Refn. Parts Co., Harvey, Ill.
30 American Injector Co., Detroit, Mich.
31 Rotary Seal Co., Chicago, Ill.
32 Harry Alter Co., Chicago, Ill.
33 Fulton Sylphon Co., Knoxville, Tenn.
34 Skinner Chuck Co., New Britain, Conn.
35 Chicago Tubing & Braiding Co., Maywood, Ill.
36 Copeland Refrigeration Corp., Detroit, Mich.
37 Zenith Carburetor Co., Detroit, Mich.
38 General Electric Co., Cleveland, Ohio
39 Snap-On Tools, Inc., Milwaukee, Wisc.

How to Figure a Specified Truck Installation
How to Figure a Specified Air Conditioning Job
Quick Frozen Foods
Licensing Regulations

The Manufacturers' Exhibit

Manufacturers who will be represented at the convention are preparing their exhibits, which will provide an interesting array of refrigerating machinery, equipment and accessories. Under one roof will be shown an exhibit of a highly educational nature to those who will be in attendance at the convention. This exhibit alone will be well worth your time at the convention. The floor plan illustrates the location of the various exhibitors.

HOTEL GAYOSO LOBBY

Entertainment Features

The first day's entertainment features will include a Bingo Party for the Ladies at 2 P. M., while the convention is in session, and a party at the Colonade Night Club in the evening for the members, guests and their ladies. On Thursday morning, a tour of the cotton industry has been planned for members, guests and their ladies, with a party at 2 P. M. for the ladies. Evening entertainment will provide a full night of activity. The annual banquet will be held at 8 P. M., and at 11 P. M., the Beale Street Palace has been reserved for the entertainment of the members and guests. On Friday, a ladies' luncheon has been provided for the afternoon, and the evening will be devoted to an Exhibitors' frolic.

Ladies' Entertainment

The Ladies' Entertainment Committee has been especially busy in planning for the entertainment of the ladies who will be present at the convention. It is expected that a large attendance of ladies will partake of the entertainment that has been provided.

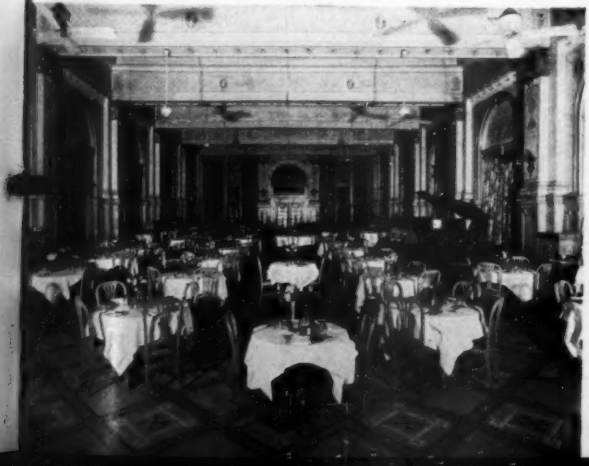
Hotel Reservations

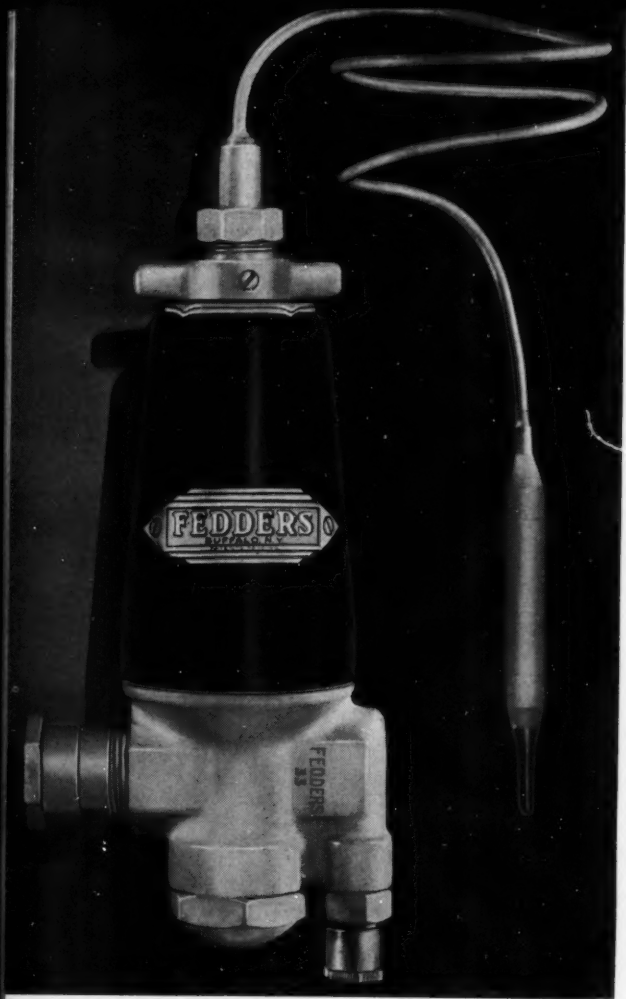
The Hotel Gayoso, where the exhibit and convention is held, is designated as the official convention hotel. However, in the event that the hotel cannot provide for all of the reservations that will be necessary, the Memphis Housing Committee has made arrangements with several other hotels conveniently situated in the neighborhood to take care of the overflow crowd.

If accommodations cannot be secured at the Gayoso, the Memphis Housing Committee will direct visitors to the other hotels.

Mr. W. Hall Moss, 2nd National Vice-President, is Chairman of the Memphis Convention Committee, in cooperation with Mr. Geo. L. Uetz, president of Memphis Chapter.

FAMOUS GAYOSO DINING ROOM WHERE ANNUAL BANQUET WILL BE HELD





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National Convention

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712 Beacon St., Boston

St. Louis Chapter Holds Annual Picnic

By E. A. PLESSKOTT

ANOTHER successful event for St. Louis Chapter can be chalked up! The annual picnic held on Sunday, September 13, given on the private estate of William Tamm of Fenton, Mo., former recorder of deeds for the city of St. Louis, provided an ideal setting for the affair.

Jobbers Cooperate

The jobbers in the St. Louis area, including Harry Alter Co., Brass & Copper Sales Co., G. S. Robins Co., Carl Schneider Co., Spangler Co., Inc., Thompson, Haywood Chemical Co., and R. E. Thompson Co., cooperated in making the affair a success.

Arrangements were under the direction of Pres. E. A. Plesskott and Secy.-Treas. L. L. Vollman, who was ably assisted by 2nd Vice-Pres. Oris Petrie, and several members and friends.

Games for All

Those who came were amply repaid with plenty of hot dogs, soda pop, beer, potato chips, ice cream, and the rest that goes to make a picnic a success. The horse shoe court saw considerable service, as did the swimming pool and the small pavilion, where the card players held forth. Soft ball and cork ball were also in evidence. It was rumored after the card game broke up that Mr. Thompson would not have to open up his store Monday, and Mr. Brown made enough gasoline money for his trip to Quincy —both statements being subject to some speculation.

The spaciousness of the grounds made it extremely difficult to estimate the size of the crowd, and for this same reason and the fact that the writer was busy attending to the wants of the picnickers, no group picture was taken. The snapshots published on the opposite page show some of the highlights of the picnic.

Several members spoke highly of the manner of marking the highway, and the general arrangements made, and expressed the belief that this spot would be the ideal one for our future picnics.

Meeting of September 10, 1936

THE regular meeting of St. Louis Chapter held Thursday, September 10, at the Crunden Branch Library, was called to order by President Plesskott at 8:30 p.m.

The previous two meetings, having been held at Garavelle's and no business having been transacted, the minutes of same were dispensed with.

In order to give full attention to accumulated correspondence from headquarters, and complete arrangements for our picnic of September 13, no speaker had been arranged for.

Correspondence from Memphis Chapter was also discussed as was the coming "Imperial Night" meeting for September 24. This meeting is to usher in our fall and winter membership campaign, as well as to start us off on what should prove to be a most instructive cycle. The members were urged to attend the few remaining meetings of this year, and it was pointed out that unless we call a special meeting during November and December to take the place of those that fall on legal holidays, there remain only a few more meetings before the close of this year.

With the coming of the Fall and Winter months, we hope the members will be planning to attend the chapter meetings regularly.

All members in arrears were urged to straighten out their accounts, so we may have the benefit of their votes at the national

---

SHOWN ON OPPOSITE PAGE

Top row, left to right. President Plesskott tries the water. L. L. (Apollo) Vollman likes the sun with his bathing. A few of the "ice creamest" and "eatingest" bunch you ever saw.

Second Row. A few of the boys silently meditate while watching the horse shoe experts. "Vanity, thy name is Woman." "Sheiking up" after a barefoot walk. At the pump, getting ready to eat again.

Bottom Row. The horse shoe experts in action. "They toil not, neither do they spin"—oh, for the life of a goldfish. Mr. O. Petri, 2nd vice-president, is pressed into service at the kitchen.

ST. LOUIS CHAPTER HOLDS ITS ANNUAL PICNIC

convention, and they in turn get their magazine and lecture courses before they are out of print.

The members were advised of the receipt of a card of thanks from Mr. V. E. Schaefering for flowers.

Final details for the convention are to be worked out at our meetings of October 8 and 22, at which time a delegate and alternate delegate will be decided upon. All members in good standing who think they will attend were requested to notify the Secretary if they feel they would care to act in either capacity.

A list of delinquents was read and any member personally acquainted with anyone on this list was requested to act as a special emissary for the President in a final effort to get the member in good standing again.

Meeting of September 24, 1936

All present were requested to sign cards from which a drawing for two attendance prizes was to be made. One was a membership in our organization, if the individual was eligible, and the other consisted of an Imperial flaring tool and tube cutter set, No. F125.

After a few words of explanation, Mr. R. E. Thompson, who was instrumental in making this "Imperial Night" possible, was presented with a button by the President.

In the absence of our educational director, Mr. Gygax, who has gone to Europe for his company, Mr. Plesskott introduced Mr. L. H. Dally, sales representative in this territory for the Imperial Brass Manufacturing Company of Chicago, and also an associate member of our chapter. He, in turn, introduced Mr. R. A. McIntosh, factory engineer, and also advised those present that Mr. W. A. Leonard, president of Imperial, had been called home due to the illness of his wife, and regretted exceedingly being unable to meet with us this Imperial Night.

Everyone present having been provided with a catalog, Mr. McIntosh got right into the heart of his subject, directing the attention of the various parts and fittings from page to page while exhibiting the counter part of the same thing, either on one of the several boards that were set up, or from one of the many tables that were literally covered with tubing, high side floats, tools, low side floats, etc.

After a brief discussion on the relative merits of high side float systems over others, Mr. McIntosh closed his remarks and invited all to inspect the displays and ask any further questions as they might occur.

Mr. Plesskott advised all present that the first name drawn would be for the choice of the gift from Imperial or the membership, and the second prize would be whichever remained; also that members were disqualified from winning the membership, and as he did not have his own name in the box felt that he was neutral and qualified to hold the drawing. This he proceeded to do and the first name drawn was that of Mr. Koci, a member, who accepted the flaring tool and tube cutter. The drawing for the membership prize was won by Mr. Wayne W. Murphy, 720 West High Street, Jefferson City, Mo., but inasmuch as he felt he was not eligible for membership, another drawing was made. The winner was Mr. Wm. Steinkamp, who gladly accepted the opportunity of joining up. He was advised to fill out an application and the Membership Committee would act on it as soon as possible.

Mr. Plesskott thanked Mr. Dally and the Imperial Brass Manufacturing Company for having provided this means of getting our fall membership drive started, and requested all who were interested to see him after this meeting.

Then, to wind up a perfect evening, all were invited to further partake of the generosity of the Imperial Company by remaining for the refreshments that were served in abundance. Truly an Imperial Night.

S S S

C. H. Riedle, Connecticut

Enclosed find $2.00 for renewal of my subscription. Could not be without the paper.

Tom Kelland, North Dakota

Enclosed is $2.00 for my renewal. I find your magazine to be a great help in field work, and especially appreciate the recent articles by L. K. Wright.

H. L. Dowell, Oklahoma

Please find enclosed money order to cover the renewal of our subscription. We certainly enjoy and find profit in your magazine and never expect to be without it.

Ontario Maple Leaf Chapter Receives Charter

WITH approximately 75 members present, Ontario Maple Leaf Chapter received its charter for membership in the Refrigeration Service Engineers' Society. This important meeting was held on Friday evening, September 25, at the Carls-Rite Hotel.

In June, a small number of service men gathered together to learn of the purposes and objects of the Refrigeration Service Engineers' Society, as outlined by National Secretary H. T. McDermott. Temporary officers were elected, and various committees appointed, and work started to secure a representative membership to apply for charter. This cooperative effort of officers and members resulted in 93 members signing the application for charter.

It was a momentous evening, and the meeting was opened by President A. E. Doan, who outlined the purpose of the meeting, and disposed of the business at hand. He then introduced National Secretary McDermott, who on behalf of the National Society, presented the charter to Ontario Maple Leaf Chapter. President Doan then read a telegram of congratulation from President Paul Jacobsen of the National Society.

Officers of Ontario Maple Leaf Chapter include: President—A. E. Doan; Financial Secretary—Gordon A. Burns; Recording Secretary—Herbert F. Nye. The membership of Ontario Chapter is composed of the following:

Geo. R. Adamthwaite
Geo. K. Aitken
Chas. Franklin Armstrong
Harry Baker
William R. Beirs
Charles Berry
Ernie Blake
William Brooke
Frank S. Brown
Gordon A. Burns
Henry G. Caldwell
Gordon Condie
James H. Crane
Geo. A. Cumin
Frederick Davidson
A. E. Doan
Harold L. Donnell
Harry Draper
Harold Emery
John L. Fair
George Fenn
Orlo Frayne
Grover S. Glass
Edgar A. Goodsell
J. Albert Graham
Herbert Green
James A. Green
William Hamilton
W. F. Harford
Leonard Harland
Norris S. Heinbuch
E. F. Blake Henderson
Chas. Wm. Hester
Carl G. Jaeger
Raymond F. Kemp
Frank Knowles
W. Knowles
R. Lawrence
Joseph H. Lehman
Robt. J. Mackie
A. N. Macpherson
William M. Madill
W. Harold Marshall
John N. Manning
William Marshall
Ritchard J. McCabe
Hugh McCowan
E. Gordon McCracken
G. V. McElroy
Jack E. McGurn
John W. McKee
C. W. Moore
Harold Moore
Edgar Morden
Hugh T. Morrison
John Mullan
James Murphy
James Murray
Clinton Nimens
Herbert F. Nye
Wm. J. Nye
Robt. O'Connell
T. H. Oliver
Arnold G. Olmstead
Harry S. Parish
Arthur Parkington
George E. Pearson
Allan Penn
Vic Persson
D. L. Phillips
John R. Potts
R. F. Reid
Robt. Murray Ritchie
W. C. Roberts
Henry M. Searle
Walter Smallwood
Edward H. Smith
W. D. H. Smith
W. H. Sneath
Thomas J. Somerville
James Spence
Joseph G. Stockdale
Joseph H. Stoliker
Wm. J. Stone
James Stratham
Frank C. Strong
George Tordiff
Edward A. Townson
R. A. Turner
Wilfred E. Weaver
David Whitton
Kenneth Wood
Harry Wm. Woods

After the formalities of the evening, a buffet lunch was provided with professional entertainment and community singing.

S S S

BINGHAMTON CHAPTER

Meeting of September 8, 1936

By LEONARD CLARK, *Secretary*
158 Bigelow St., Binghamton, N. Y.

THE regular meeting of Binghamton Chapter was held at the Radio Testing Station, 25 Sturges Street, which began the Fall season. Fred Landon, president, was the presiding officer.

After the opening the meeting was taken over by Mr. V. E. Hall, and an open discussion followed on lining up a program for the Fall meetings.

The Chapter was given the pleasure of a talk by Mr. F. J. Hood from the Ansul Chemical Company, dealing with the two refrigerants SO_2 and methyl chloride and ending with the known facts on the importance of a highly refined oil in a refrigerating system.

At the close of the meeting a buffet lunch was served.

2 IMPORTANT THINGS TO REMEMBER—

● **R.S.E.S. 3rd ANNUAL CONVENTION, MEMPHIS, TENN. NOVEMBER 11, 12, 13, 1936**

● **Whatever your needs in Parts, Supplies and Equipment—"B-A HAS IT!" Faster Service from "The Heart of America." Lowest prices. Do you have our big, new Refrigeration and Electrical Wholesale Buyers' Guide? If not—write today! It will pay you to be on our mailing list!**

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Memphis Chapter Exhibits at Mid-South Fair

(Photograph of Exhibit is shown on Cover)

VISITORS to the Mid-South Fair held in Memphis, Tenn. (one of the outstanding fairs of the South) had the opportunity of learning about the Refrigeration Service Engineers' Society, and that such an organization of service men was in existence.

The display booth, which attracted throngs, is illustrated on the front cover of this issue. It measured twenty feet square, and was located in the Electrical Building, which housed all electrical equipment displays. The exhibit attracted considerable interest because it showed the operation of hermetic machines, of which the following were on display: Frigidaire, Servel, Crosley, Westinghouse, Grunow, Norge and General Electric.

One of the interesting features of the display showed a General Electric unit, which had been damaged in the Tupelo tornado, and was found one-half mile from the point of its original installation, but the cabinet was never located.

On display in the exhibit were also included belts, an attractive board showing Fedders products, Imperial refrigeration service tools, valves and fittings, Penn Electric controls and Virginia Smelting gas in small service drums.

Each visitor to the exhibit received a copy of a four-page 6x9 folder, which extended greetings to the visitors to the Mid-South Fair, and a cordial invitation to attend the Third Annual Convention of the Refrigeration Service Engineers' Society. Pages 2 and 3 were devoted to the purposes and objects of the Society, and outlined the advantages of the users of refrigerating equipment employing members of the Society for

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404 N. Wells St. Chicago
17 W. 60th St. New York, N. Y.

their service work. On the fourth page were listed the officers and Board of Directors, as well as all of the members of the local chapter.

The Mid-South Fair provided a splendid opportunity of acquainting a large number of visitors with the services of qualified service men, and Memphis Chapter is the first local chapter to adopt this method of publicity. Many favorable comments were received by Memphis Chapter for their progressiveness in their exhibit at this fair.

* * *

PITTSBURGH CHAPTER

Meeting of September 14, 1936

By F. V. GOLITZ, *Secretary*
1518 Davis Ave., Pittsburgh, Pa.

THE regular meeting of Pittsburgh Chapter was held on Monday, September 14 in the air conditioned Corporation Room of the Commonwealth Building. President C. O. McCauley presided, approximately sixty members and visitors being present.

The correspondence regarding the fare rates to the convention in Memphis was read by President McCauley and same was commented on by the members. The Secretary was instructed to contact additional transportation companies for additional quotations. The President was instructed to officially notify the National Headquarters that Pittsburgh Chapter wishes to entertain the convention in 1937.

President McCauley reported that he and Secretary Golitz met with Mr. O. C. Frey of the Pittsburgh Convention Bureau and Mr. J. C. Nord, the business manager of the William Penn Hotel on August 11 and discussed the possibility of bringing the convention to Pittsburgh in 1937. Mr. Frey assured the officers of the fullest cooperation of the Convention Bureau in this matter.

The Secretary was instructed to mail out return cards to ascertain the number of members who are planning to attend the Memphis Convention.

An invitation by Mr. G. W. Lane of the Electric Products Corporation, Frigidaire distributors, to hold the next meeting at their quarters was unanimously accepted.

Deluxe Scurlock Kontanerette Kits

Many distributors and dealers are increasing their sales of refrigerators at this quiet season of the year by the addition of Scurlock Deluxe Kontanerette Kits. We can supply you these Kits to the retail value of from $2.75 up to $11.00. One large refrigerator company last year at this time moved five thousand refrigerators that they were unable to sell during the current season with the addition of some Deluxe Kontanerette equipment to the refrigerator. It will help your sales, as it is helping others. Write us for information on a new Deluxe outfit listing at $11.00. It is about the finest thing ever put in a refrigerator. Address the

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The business meeting was adjourned and the members and visitors were escorted in a body to the Mellon National Bank Building. Our host at that point was Mr. H. A. Biber, a member of Pittsburgh Chapter, who is the engineer in charge of the air conditioning plant. Some of the technical features of this plant are: two compressor units, 3-stage rotary, driven by 200-hp. synchronous motors. Normal load, 450 amperes, at 220-volts. Refrigerant, water, high side pressure 28.2 inches, low side pressure 29.64 inches. Normal water consumption 200 gallons per minute. Air circulated by four banks of fans in the basement and four banks on the third floor. The air cleaning medium consists of traveling mesh screens immersed in oil. Installation time, nine months, at an approximate cost of $800,000. After explaining the many features and the operation of this plant, Mr. Biber answered many questions.

The members of the party adjourned at midnight.

The officers and members of Pittsburgh Chapter wish to thank Mr. Biber and the Mellon Bank for the opportunity afforded them to visit this plant.

KANSAS CITY CHAPTER

Meeting of September 15, 1936

By **R. E. KINGSOLVER**, *Secretary*
1115 East Armour, Kansas City, Mo.

The meeting was called to order by President R. F. Cox at 8:30 p. m.

Roll call of officers and members was taken.

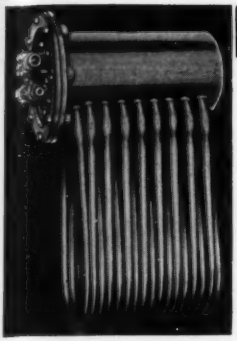
It was announced that Kansas City Chapter received third place in the membership drive, and received a cash prize of $10.00.

Several letters from the National Headquarters were read by President R. F. Cox.

The speaker of the evening, Mr. Luskom of the Penn Control Company, was introduced by Mr. Roberts of the Forslund Pump and Machinery Company. Mr. Luskom gave a very interesting talk on Penn Control equipment.

Meeting of September 29, 1936

The minutes of the meetings of May 26,



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AT YOUR MEMPHIS CONVENTION
NOVEMBER 11, 12 and 13
LET'S GET ACQUAINTED

FREE CATALOG AND BUYERS GUIDE

AIRO SUPPLY CO. 408-410 N. Wells St. CHICAGO, ILL.

June 9, June 18 and September 15, 1936 read and approved.

Treasurer's report given by Secretary R. E. Kingsolver—April 14 balance $56.97, and September 29 balance $60.10.

Mr. S. A. Leitner, H. L. Green and Cal Kester were appointed on a committee to see all refrigeration parts companies in regard to selling to buyers not entitled to net prices.

* * *

CENTRAL NEW YORK CHAPTER

Meeting of September 14, 1936

By F. G. MACKIN, *Temporary Secretary*

THE meeting was called to order at 8:00 p.m., by Temporary Chairman Carl Stewart. The minutes of the previous meeting were read by the Secretary and the Treasurer gave a report to date. Both reports were accepted as read.

Old business was continued. A talk was given by Mr. Persett on the benefits of the Society in regard to codes and ordinances. There was also a discussion by the members on the subject.

New business was taken up. Motion was made by Mr. Persett and seconded by Mr. Harder that a committee be appointed to invite Mr. Rapp and his assistants, Mr. Handlin and Mr. Wilkes, to attend the charter presentation; motion seconded and carried. The same committee is to assist the Secretary on the arrangements for this meeting, and consists of Messrs. Livingston, Persett and Harder.

The Secretary was instructed to write to headquarters for a supply of National Constitution and By-Laws to be given to the members.

A Publicity Committee was appointed, consisting of Messrs. Schwartzberg, Davenport and Frost.

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REPLACEMENT
$19.00

Standard Water Cooled Condensers

New—Repaired—Exchanged

New Replacements for Frigidaire Model N $19.00—For Model C $26.00
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Send for our new bulletin, just issued, illustrating
Standard Evaporators—Condensers—Fin Coils

Standard Refrigeration Parts Co.
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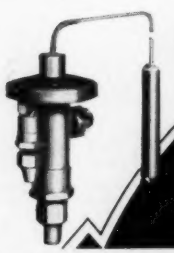
Booth 6, R. S. E. S. CONVENTION



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Write for complete Bulletin of types, sizes and applications.

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CHICAGO CHAPTER

Meeting of September 8, 1936

By WILLIS STAFFORD, *Secretary*
726 Hinman Street, Aurora, Illinois

THE regular meeting of Chicago Chapter was held at the Stevens Hotel on September 8th. The minutes of the previous meeting were read and several new applications for membership were accepted.

A letter from Memphis Chapter asking for amateurs to appear in a contest at the national convention was read and discussed.

The program of the national convention was discussed at length by the members. Many questions were asked of Mr. Paul Jacobsen regarding the convention. He assured us that a good time would be had by anyone who attends.

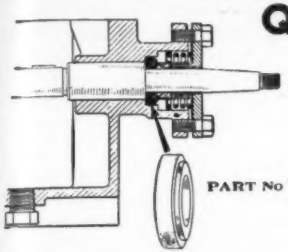
Mr. Willis Stafford gave an interesting description of an air conditioning plant installed in a western suburb of Chicago this summer.

A report on the forthcoming stag was given by the Chairman of the Entertainment Committee—Mr. Herman Goldberg.

WILLIS STAFFORD, SECRETARY
CHICAGO CHAPTER

The effect that the new Patman Law, which governs prices, is going to have on our industry, was brought up by Mr. Herman Goldberg, and was discussed by the members.

Mr. Joe Corso suggested that as an educational feature we make a tour of the air conditioning plant here at the Stevens Hotel sometime in the near future.



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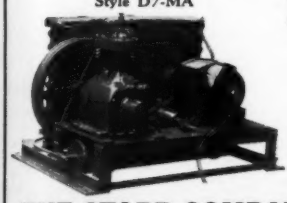

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Mr. Willis Stafford was elected Secretary to fill the vacancy left by Mr. Harry Busby, who is now located in Marion, Indiana.

The meeting adjourned at 9:30 p.m. so that the members might engage in personal chats.

Meeting of September 22, 1936

The meeting was called to order at 8:15 p. m. by President Jacobsen.

The proposed changes to the National Constitution and By-Laws were read by the chair.

The meeting was then turned over to the Educational Committee. A representative of the Chicago Tubing and Braiding Company gave a very interesting demonstration of their line of charging hoses and vibration units.

The business meeting was then continued. A letter from the National Secretary was read concerning the election of a delegate and alternate to the National Convention. The election was set for next meeting. Their credentials should be in the secretary's office before November 1.

Mr. Goldberg was appointed as chairman of an "investigation committee" to compile a report on the cost and desirability of holding the National Convention in this city. This report is to be presented at the convention in Memphis.

The membership approved of buying a new model 80 Mimeograph from the A. B. Dick Co.

Mr. Goldberg reported on the stag. The date was set for October 27th.

The meeting adjourned at 10:30 p. m.

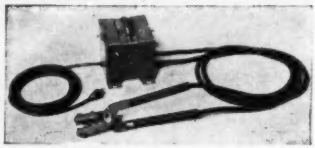
S S S

"THE 'CONTRIBS' COLYUM"

By "THE KINGFISH"

WE SEE by our correspondence that Pittsburgh Chapter is seriously thinking of getting the 1937 national convention. We received a pleasant invitation to consider their facilities and logical location as the center of the greatest number of people in the United States. We do wish President McCauley luck with his efforts. Pittsburgh is a fine city.

Heat and Grip at Same Time



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Happened to be in Indianapolis over Labor Day and saw our National President Paul Jacobsen absorbing the finer points of how to make ice cubes in five minutes in a Coolerator refrigerator. It seems one takes a contraption similar to an ice cube tray and places it up-side-down on the large cake of ice in the ice chamber and in a few minutes the grid and sides of tray have melted their way into the ice. Now one takes a special three-pronged ice pick and stabs the cubes of the ice cake. No witchcraft, ladies and gentlemen; come and see for yourselves; the only refrigerator making ice cubes in five minutes.

* * *

Mr. and Mrs. Harry Busby from Marion, Indiana, were also seen, at the Indiana State Fair, admiring the livestock and the prize poultry. You know, some day Harry is going to be a regular dirt farmer!

* * *

The battle axe is counting the days until we are going to Memphis. She says she is dying to learn what "Southern Hospitality" is like, but also claims that she will not go to the gin mills as she never did like "hard liquor." Just a simple "gal" from the country.

* * *

Judging by the pictures sent in by Plesskott, they had a real picnic in St. Louis this year, with plenty of splashing around the water and lots of good things to eat. Cleanliness was the watchword, if one may believe all the pictures of boys and girls washing themselves by the old hand pump.

* * *

The boys in Toronto, Canada are to be congratulated on the fine showing at the presentation of the charter to Ontario Maple Leaf Chapter. They really have a large number of men together, and we (The Kingfish) extend to them our greetings and invite them to join the great order of Colyum Contributors. No obligations, and no dues.

* * *

As the trains rush past our house, we often get the travel fever,—the old urge to go places and find out how other people do things, and especially how they do things in smaller communities. By "other people"

we naturally mean other service engineers and we know that there are many of them who have come into the servicing business through some trick of fate and who are making a success of it.

We should like to hear something from you men who are away from the larger cities—how you got in the "game" and how things are done out your way. In other words, take those from the large cities on a mental tour of your country and let us spend an evening together to break the monotony of the day and to learn something new.

* * *

Mr. K. P. Galbreath of St. Louis Chapter holds some kind of a record. He attended the chapter meeting making a 300-mile trip from his residence to do so. And while I am on the subject of St. Louis, how come that Mr. M. Brown's wife for some reason or other calls up and requests to speak to him at almost every meeting. Almost felt sorry for him last meeting. He didn't show up until after 9:15 p. m. and his wife had called at 8:15 p. m.

* * *

CHICAGO CHAPTER CHATTER

By HERMAN GOLDBERG

STUDENTS of business psychology in general agree that the average person engaged in business does not recognize the forward movement toward better times and increased prosperity until it is actually an accomplished fact recognized by the average consumer.

The larger business houses with their trained forces and available cash as a rule benefit in the earlier or first stages of increased business activity. However, it usually takes quite some time before circumstances permit smaller operators to in turn benefit not only from the natural trend towards better conditions but also from the increased activities of the larger organizations.

Due to his more or less limited capital, equipment, and organization, the smaller business man is at all times relatively more

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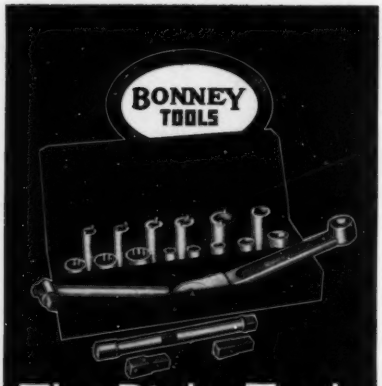

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cautious than his larger competitors in going out after new business in the beginning of a business boom. As conditions become better and cash becomes freer, one of the greater advantages of the smaller business man is that he can adjust his policies more readily and easily to the changing situations.

For quite some time now, a great number of the larger corporations have shown substantial improvements in their businesses, and it is my sincere belief that the time is now ripe for smaller business men to take more aggressive methods towards increased business. This, however, cannot be accomplished without a certain amount of courage to overcome the fear that has been put in our minds through years of depression.

It is along the thoughts in general as outlined above that this column will be conducted, and any contributions or suggestions by its readers will be gratefully received.

Incidentally, it looks as though all refrigeration roads are going to lead to Memphis for the convention, November 11th, 12th and 13th. *Come and get acquainted.*

✕ ✕ ✕

Shotwell-Carver Co., Inc.,
Iowa.

This company took over the Hawkeye Supply & Mfg. Co., the first of January and we are wondering about the subscription for the REFRIGERATION SERVICE ENGINEER. We do not want to lose out on a single copy, and if the old subscription has run out in any way, kindly let us know the details, and if we have missed any issues, please see that we secure same.

F. Henry,
Texas.

Find enclosed check for $2.00 for renewal to your RSE magazine. Pleased to see it get better and bigger.

H. L. Dowell
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Please find enclosed money order to cover the renewal of our subscription. We certainly enjoy and find profit in your magazine and never expect to be without it.

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This valve installed at or near the suction inlet port of the compressor will relieve the serious difficulty experienced at times with practically every commercial installation, particularly flooded type systems—such as an overloaded motor condition due to high back pressures which are beyond the capacity of the motor to handle continuously without dangerous overloads. Conditions of this kind are indicated by abnormally high head pressures, frequency of cycling, blown fuses or burned-out motors.

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CHICAGO EYE SHIELD CO.
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CHICAGO, ILL.

QUESTIONS AND ANSWERS

(Continued from Page 27)

tles the refrigerant through at a lower and lower pressure so as to maintain a balance with the power element which exerts continually less force as the bulb temperature decreases. The needle does not shut off then until the machine shuts off and the pressure in the body of the valve builds up more rapidly than the pressure in the power element so that the force exerted by the power element is overcome by the increased force of the expansion valve bellows and the needle is actually closed.

CREAMERY JOB

QUESTION 157. *I am figuring a small creamery job that has one 300 gals. capacity ripener and cooler. The situation being that they cool 250 gals. of cream at a temperature from 80° to 45°, which is then run to the churn, and immediately followed by another batch of the same proportion, which is put to cool in the ripener. This makes a total of 500 gals. to be cooled at one time. This is done every other day.*

I had planned to use a brine tank of sufficient capacity to cool the load, but according to my figures, it would take approximately 1,900 gals. of brine. This seems like a lot of brine for a job of that size.

A Lighting Brine Cooler was suggested because it would use much less brine. What is a Lighting Brine Cooler? What are its principles? Any information or suggestion you have in mind concerning this job will be greatly appreciated.

ANSWER: I believe I can give you a real suggestion for your particular problem and that is that you use a brine tank containing a eutectic freezing solution for refrigeration storage.

You say that you have 250 gallons of cream to chill from 80° to 45°, which is followed by another batch of the same size or that 500 gallons then is to be cooled at one time from 80° to 45°.

If we assume the specific heat of cream to be equal to that of water, this would give us a total amount of heat to be removed in a short time of 17,500 B.t.u.'s and, of course, the specific heat of cream would undoubtedly be slightly less than water so that if we figure on this amount of heat removal, it should be adequate.

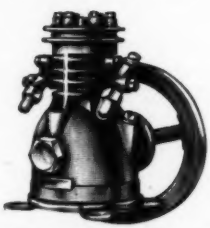
My suggestion for your particular problem would be to make a brine tank having a capacity of approximately 100 to 125 gallons using a solution consisting of 23% barium chloride in water in this tank and put your refrigeration coils in this solution. The barium chloride solution will freeze at a temperature of approximately 17 to 18° F. and you will store refrigeration by the freezing of the solution instead of by lowering the temperature of the brine.

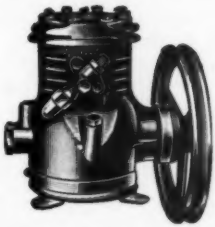
In this same tank locate a coil through which you can pass a low temperature brine such as calcium chloride which will go to your cream cooler. This brine will require a small brine pump to circulate it through the coil in the brine tank and also the cream cooler. This calcium chloride low temperature brine may be cooled in the tank containing the barium chloride brine and will cool the cream in the cream cooler.

With respect to size of tank required it makes about the same difference we would have in cooling a refrigerator by a cake of ice or in trying to cool the refrigerator by putting in a brine tank to be filled with a low temperature brine and allowing the brine to warm up. This tank would have the advantage in that the brine temperature would be very nearly the same for the whole run of the cream whereas in using a non-freezing brine for refrigeration storage the brine would warm up as it was used and give us a variable cream cooling condition. I refer you to the article in this issue on "Refrigeration Storage."

The Lighting Brine cooler that you referred to may be a brine cooler which works on a principle similar to the Temprite Beverage Cooler only operating at temperatures below 32°. That would be my guess as to the kind of device that would fit the name. However, this would not be practical for your problem as you would then have to have a machine large enough to remove heat at the same rate you were removing heat from the cream which would be a very large machine.

"Chieftain" Quality Built Compressors and Condensing Units





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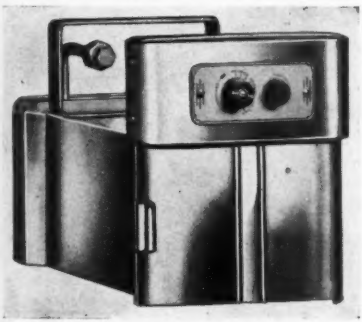
"Chieftain" Compressors are made to last. Precision limits are maintained on all parts. Our new and exclusive lubrication system insures longer life and higher efficiency, as well as a quiet operating unit.

In addition to quality we offer prices that will permit you to make a higher percentage of profit as well as a saving of time, which will enable you to satisfactorily handle a larger volume of business.

TECUMSEH PRODUCTS COMPANY, Tecumseh, Michigan

Refrigeration Division



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The new principle, HIGH HUMIDITY, QUICK FREEZING Evaporator that modernizes your jobs at less cost than repairing.

In 1937 line of Household Evaporators with 1937 sales points.

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2. High Box Humidity.
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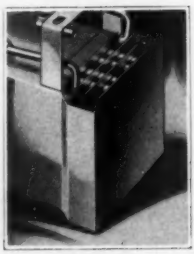

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Cools box Quickly.

Does not clog up with frost. Proper ratio of fin surface to tube surface and proper air circulation over fins provides defrosting cycle.

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REPRESENTATIVES IN ALL PRINCIPAL CITIES

FROSTAIRE REFRIGERATOR

QUESTION 158. *Kindly advise the amount of oil used in Frostaire refrigerators. It is a 2-cylinder methyl chloride compressor, manufactured by B. F. Sturtevant Co., Hyde Park, Boston, Mass.*

ANSWER: I have no data on the quantity of oil used in Frostaire refrigerators and believe it is one of those machines which has had a large local sale as I have never heard of that particular machine in this locality.

My general practice is to judge by the oil level in the compressor crankcase. Be sure there is a sufficient level maintained for the connecting rods or eccentrics, whichever the compressor makes use of, to dip into the oil and furnish sufficient splash to give adequate lubrication. If the oil level is two inches above the bottom part of the connecting rod when the connecting rod is in the bottom of the stroke, you can be pretty sure that you will have sufficient oil splash for adequate lubrication.

FORCED DRAFT JOBS

QUESTION 159. *Here is a problem concerning the operation of back pressure on two forced draft jobs. The installations are nearly identical—a Westinghouse ⅓ hp. condensing unit, G E conditioned air coil, thermostatic expansion valve, and Freon refrigerant. The second job is the same except that it has a Fedders forced draft coil.*

The troublesome controls are Penn, type L, back pressure, and are teed into the suction lines in a horizontal position about three feet from the coils. The suction lines are less than eight feet long in both cases.

Upon checking this operation during the day I find everything in order—head pressures correct (according to L. K. Wright's chart); back pressures originally set at 24 lbs., but varied all the way from 16 to 28 in trying to find a cure for the difficulty. Box temperatures were maintained at 36° to 38°

After about five years' service refrigerator door gaskets should be replaced. Tens of thousands of refrigerators are now at the point where new door gaskets are necessary.

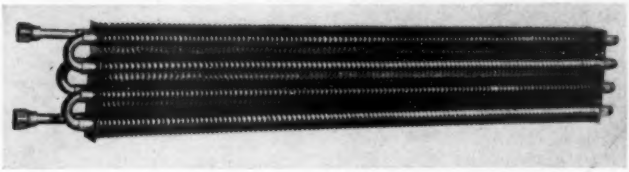
Are you getting your share of this profitable business?

You can meet 80% of all replacement needs from the 20 gasket types offered in the simplified Miller line.

Send for your file copy of illustrated price list. There is a demand for this service—meet it with Miller Refrigeration Gaskets. *If your local jobber cannot supply you write direct.* Miller Rubber Company, Inc., Akron, Ohio, U.S.A.

ROME *Announces*

A new bulletin 110 covering ROME FROST FREE EVAPORATORS



These compact Rome Coils can be used in many places where ordinary coils will not fit. SEND FOR YOUR COPY.

ROME WATER COOLED CONDENSERS of "tube within a tube" type are making money for service men who have opportunity of changing over inefficient air cooled installations.

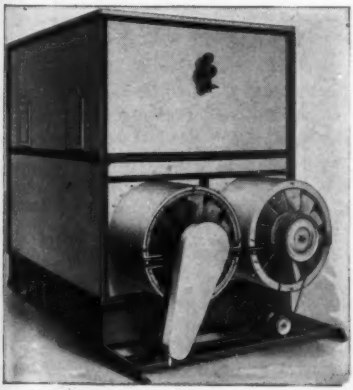
ROME-TURNEY RADIATOR CO.

300 South James St. ROME, N. Y.

Makers of air heating and air cooling equipment. New air cooling bulletin now ready.

BINKS SPRAY COOLING TOWERS

Indoor Forced Draft Type Will *Save Money for You!*



What happens to the circulating water after it passes through your Ice Machine Condensers?

If discharged to waste you are literally pouring good hard earned dollars down the sewer! Check your water bills . . . see how much you are throwing away. You'll be surprised.

A Binks Cooling Tower permits the constant recirculation of the required supply, cooling and using it over and over again and again, substituting a small pumping charge for the former heavy water bills.

There are more than three thousand Binks Cooling Towers now in operation including sizes for all standard commercial refrigeration units. Let us tell you more about it, and how YOU TOO can cut the water costs of your present equipment by as much as eighty per cent.

Write Today for Bulletin No. 70

BINKS MANUFACTURING CO.

3151 Carroll Ave. Windsor, Ontario-Canada CHICAGO, ILL.

during the day with control settings of 36 lbs. in and 16 lbs. out. However, I tried cut-in adjustments of from 14 to 18 lbs. The jobs cycle normally during the day, but each night the box temperatures soar to 50° and 55° with the controls remaining open.

The ambient temperatures do not drop below 55° at night, and I've checked the voltage with a recording meter to be sure it does not drop enough to open the Spencer discs.

I have corrected the trouble with thermostatic controls, but I'm still trying to decide why the original installations refused to function. Have I overlooked some important installation practice or is it just the pure cussedness of inanimate things?

ANSWER: I believe your trouble is due to a large variation in load on your refrigerators. During the day the temperature around the box and with the cooler in use air may enter the refrigerator and tend to warm up the bulbs of the thermostatic expansion valves and also the coils which will give you a sufficient pressure to make your pressure control cut in, while during the night with the lower temperature around the cooler it is possible that the coils do not warm up anywhere nearly as quickly and, when the machine does cut in, it may be possible that the pressures are pulled down very rapidly and the machine cuts off before it has a chance to really dig in and do a fair amount of refrigeration.

I believe your answer of correcting the trouble by thermostatic controls will probably be the best answer to the problem as these controls will give you a definite temperature in your cooler regardless of the variation in load.

It is possible that, if the cut out pressure was somewhat lower than you had it, that the machine might dig in and accomplish a little refrigeration when the load on the cooler was low. We find quite generally that where a refrigerating machine is low in capacity it may tend to keep the cooler at a lower temperature than if the machine has ample capacity to cycle freely and it is quite probable in your case that during the day with a high load on the cooler the condensing unit operated almost continuously while during the night with low load the machine cuts out readily and allowed the cooler to warm up.

This might also have been remedied to some extent by a control setting of approximately 32 lbs. on and 12 lbs. off, but in any case the pressure control will not give the definite temperature regulation that the temperature control gives.

CORRECTION IN PROPOSED CONSTITUTION AND BY LAWS

AN omission has occurred in the printing of the proposed changes to the Constitution and By-Laws of the Refrigeration Service Engineers Society which will be acted upon at the Memphis Convention—November 11, 12 and 13, 1936. The following should be substituted for Article VIII as it is now printed:

ARTICLE VIII
Officers

*Section 1—The officers of this Society shall consist of a President, a First Vice-President, Second Vice-President, Secretary, Treasurer, and Sergeant-at-Arms. The first three officers, consisting of the President, First Vice-President and the Second Vice-President, shall be promoted in such manner that at each annual meeting the First Vice-President shall become President, and the Second Vice-President shall become First Vice-President, provided they have worked for the best interests of the Society and have conformed to and abided by its Constitution and By-Laws.

*Section 2—At each annual meeting a Second Vice-President, a Treasurer, a Secretary and a Sergeant-at-Arms shall be elected.

*Section 3—There shall be a Board of Directors, which shall consist of the officers and five active or certificate members, these members to be elected by ballot at the annual convention, and to hold office for one year or until their successors are duly elected and qualified. Officers to be advanced or elected must be present at annual meetings when elections are held.

Section 4—There shall also be a Board of Advisors composed of members who are Past Presidents, the chairman of which shall be the last retired President.

FREE SERVICE

NO such thing exists—somebody pays! Free service has caused more failures in the refrigeration industry than all other causes combined. No guarantee given by a manufacturer can compensate you for the cost of service calls. Poor design of the installation and cheap equipment invariably result in a loss.

SERVICE-FREE

An installation SERVICE-FREE is the profitable one. Proper low side design, correct liquid distribution and the best control devices money can buy show the greatest profits.

Why not avail yourself of the facilities offered by a company with a wider experience in refrigerant control than all others in the field combined.

ALCO

ALCO VALVE CO., INC.
2630 Big Bend Blvd., St. Louis, Mo.

ANSUL
CHEMICAL COMPANY
MARINETTE WISCONSIN

New Mechanical Devices

(Continued from page 31)

The Q. A. Shaft Seal Shoe can be applied at the time of manufacture of the compressor, or subsequently when the shoulder beboth instances without removing the shaft from the machine.

The assembly consists of a steel ring hardened, ground and lapped, a gasket assembled easily slipped into position using any standard compressor seal.

A descriptive folder has been prepared thoroughly illustrating the construction of the shoe, and its application. The circular can be secured by writing direct to the above company. The most popular size is for the 5/8-inch shaft size. The shoe is packed 12 in a box, which retails at $5.00 per dozen, prepaid in the United States.

Colman Mullin also specializes in parts for orphan machines.

CALCULATOR FOR PSYCHROMETRIC PROBLEMS

RECENTLY developed "psychro-calculator" has been designed to be used in determining psychrometric values and properties of air and water vapor mixtures. By one setting of the movable indicator, any two of the four psychrometric values (dew point, dry bulb, wet bulb and relative humidity) may be obtained if the other two are known.

In addition to serving the purpose of the psychrometric chart, the calculator will give such values as weight of saturated vapor per lb. of dry air in grains; vapor pressure in inches of Hg. and weight of saturated vapor per cu. ft. in grains by reading direct from the dew point temperature. Values found from the wet bulb temperature are total heat in B.t.u. per lb. of dry air with vapor

REFRIGERATION PARTS AND SUPPLIES

FACTS IN SPORTS

ROCKNE'S RECORD AT NOTRE DAME

From 1908 to 1930 while Knute Rockne coached at Notre Dame, the Irish won 105 games, lost 12, tied 5, scored 2,847 points. Opponents scored only 625 points.

You Too Can Win with Borg Warner

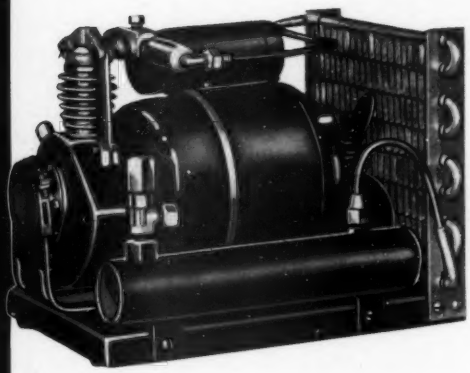
In a winning squad you'll find teamwork, complete mastery of detail and the will to win. Here at Borg Warner, you'll find teamwork that helps you in emergencies, careful attention in the filling of orders and an intense desire to serve you better—plus a most complete stock of "products of experience" made by reputable manufacturers. Ask for your Borg Warner catalog.

"Products of Experience"
BORG WARNER SERVICE PARTS CO.

BORG WARNER SERVICE PARTS CO.
Division Borg-Warner Corporation
2100 Indiana Avenue Chicago, Illinois

KELLOGG COMPRESSOR AND MANUFACTURING CORPORATION

EXCLUSIVELY
KELLOGG



Only Kellogg can give you ALL these features: Greater capacity—lower operating cost—longer life—less vibration—less weight—smaller size!

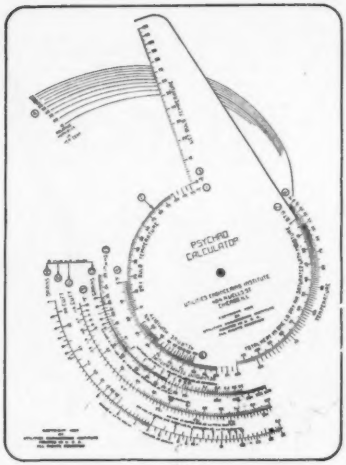
Combined, these features make it the ideal unit for installation wherever a 1/6 or 1/4 H. P. unit should be used.

Because of its small size, service organizations find this the only unit that can be used to replace many obsolete hermetic units.

The low price on these units means greatly increased profits for you.

Upon request we will gladly send you full information and prices on both domestic and commercial units.

KELLOGG COMPRESSOR & MFG. CORP.
79 HUMBOLDT ST. ROCHESTER, N. Y.



PSYCHROMETRIC CALCULATOR

to saturate and the difference in total heat of any two wet bulb temperatures. Values that may be read directly from the dry bulb are volume in cu. ft. of 1 lb. of dry air, without any adjustment, and the volume of moisture to saturate one lb. of dry air. Any partially saturated mixture from 0° to 120° F. may be evaluated.

Instructions for the settings are printed on the reverse side. Can be read to two or three significant figures, depending upon the location on the scales. Based upon standard barometric pressure.

The calculator is 7½x10½ in. and is cleanable and is produced by the Utilities Engineering Institute, 404 N. Wells St., Chicago, Ill.

NEW FLASHLIGHT SCREW DRIVER

KNOWN as No. OF5, Bonney Forge & Tool Works, Allentown, Pa., has added a flashlight screw driver to their line.

This tool will be found exceptionally handy by the mechanic whose work requires the servicing of automobiles, oil burners, electric refrigerators, radios, in fact on any equipment that needs a screw tightened in a dark spot. By simply switching on the convenient light in the handle of this screw driver, ample light is provided for any adjustments.

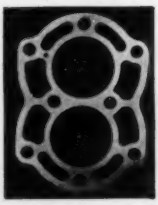
The handle is of transparent, amber-colored, non-conducting composition material containing two standard flashlight batteries and bulb. Blade is 3/16" in diameter with 3/16" tip. It is made of fine quality screw driver steel, tempered overall and securely anchored in the handle. The tip is machine-ground and magnetized for picking up small objects. Blade is 5" long. Length overall is 10½ inches.

S S S

AIR-CONDITIONED BUS

THE first air-conditioned motor bus was previewed this summer at Mills Novelty Company Factory, 4100 Fullerton Avenue, Chicago. The bus is the property of the Duro Metal Products Company, and is their "Show Shop for Home Mechanics."

The interior is equipped as a complete home mechanic's workshop and is the company's novel way of merchandising their line of drills, saws, lathes, and machinery—all for use in a home workshop. The "Shop" is sent all over the country to show the



Replacement
Gaskets

A real service for servicemen. We carry in stock, gaskets for old and new models of practically every unit ever built. All gaskets packed in uniform boxes, with manufacturer's part number and quantity. 24 hour shipping service.

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CHARGING VALVES FOR ALL HERMETIC UNITS

Including General Electric, Majestic, Cold Spot, etc. . . . These valves are constructed so that fittings can be readily replaced if worn. . . . Metallic packing insures leakproof valves. Stem adapters made of high grade steel. . . . Styles and prices promptly furnished upon request.

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Krupp Valves for Mechanical Refrigeration

3rd Annual Convention
REFRIGERATION SERVICE ENGINEERS' SOCIETY
Memphis, November 11, 12, 13

THIRD ANNUAL CONVENTION
REFRIGERATION SERVICE ENGINEERS' SOCIETY
EFFICIENT REFRIGERATION SERVICE
WE DO IT RIGHT
REFRIGERATION SERVICE ENGINEERS' SOCIETY CONVENTION
NOVEMBER 11, 12, 13, 1936
MEMPHIS, TENNESSEE

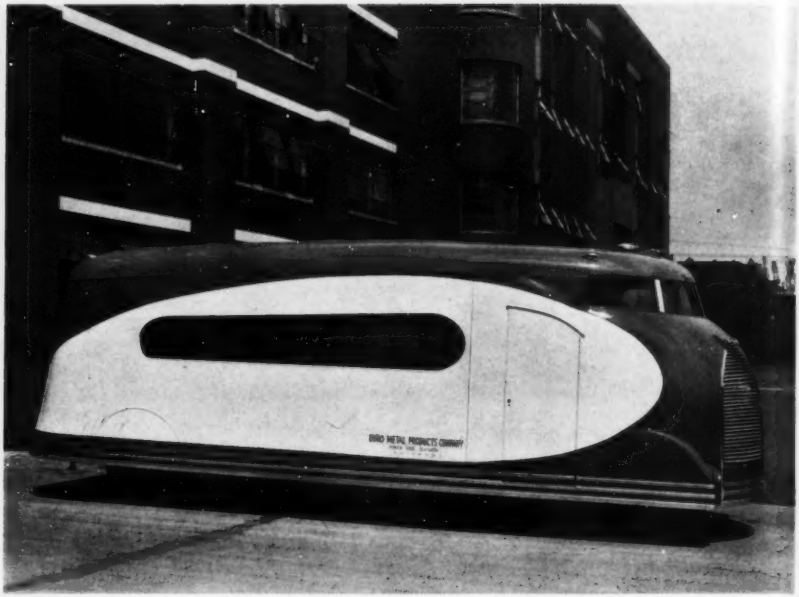
GREETINGS ..

to the members of the Refrigeration Service Engineers' Society from the makers of Extra Dry ESOTOO and V-METH-L

We look forward to meeting many of you at Memphis. Your problems are to a great extent our problems. It has always been our aim to cooperate in every way possible with those who use our products. At our exhibit in the Convention we shall show DRIERITE—a thoroughly tested drying agent which many service engineers have been using with much satisfaction for many months. DRIERITE removes water from both liquids and gases—does not disintegrate on taking up moisture—does not increase the acidity of refrigerants.

Folders and other literature on DRIERITE, on Extra Dry ESOTOO (liquid sulphur dioxide made especially for the refrigeration industry) and on V-METH-L (Virginia methyl chloride) are available to those who do not get them at Memphis. Write to F. A. Eustis, Sec., 131 State St., Boston, to the Virginia Smelting Co., West Norfolk, Virginia, or to any of the 72 distributors and jobbers who are prepared to make immediate shipments of Virginia Smelting Company products.

VIRGINIA SMELTING CO.
WEST NORFOLK, VIRGINIA



AIR CONDITIONED BUS WITH MILLS UNIT

products to department stores and hardware dealers.

The Sales Room on wheels is completely streamlined, painted in brilliant red and white, and outfitted with modern steam heating and electric power plant.

The entire air-conditioning system was designed, manufactured, and installed by Mills Novelty Company under the supervision of Allen Trask, Chief Air Conditioning Engineer. The Shop was designed by T. L. Hedgpeth, Chief Engineer and Sales Manager of Duro Metal Products Company.

NEW IDEAL CATALOG

UNDER the title, "Ideal Motor and other Maintenance Equipment," a new catalog and reference book No. I-936, has just been issued by the Ideal Commutator Dresser Co., Sycamore, Ill.

It is an attractive catalog of 68 pages, profusely illustrated, and in addition to the extensive line of products for electric motor and maintenance work, there is considerable interesting and valuable information on the modern trend of motor maintenance.

KRAMER
COIL PRODUCTS
—A Complete Line
Send for Catalog
TRENTON AUTO
RADIATOR WORKS
TRENTON, N. J.
Kramer Auto Radiator Corp. New York, N. Y.
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Service
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Refrigeration Parts
Tools and Supplies
WRITE FOR OUR CATALOG
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2334 S. MICHIGAN AVENUE, CHICAGO

A NEW FIELD FOR SERVICE!

KOLD-HOLD

HAS BECOME THE PREDOMINANT METHOD OF TRUCK REFRIGERATION

Place yourself in position to share in the important revenue to be derived from this large and constantly increasing field.

The Only Holdover System
Employing a True Cryohydrate!

The solutions used in Kold-Hold Cooling Units are true Cryohydrates which melt at constant temperatures from start to finish and do not deteriorate with constant use. They possess minimum weight and maximum capacity, contain no poisonous or lethal substances, are perfectly safe for use under all circumstances. These Cryohydrates are fully covered by Patents and Applications Pending and are used only in Genuine Kold-Hold Cooling Units.

Service tests and actual experience prove that many so-called Eutectic brines and jelly solutions used in other types of holdover systems give fair performance when first placed in service, but rapidly deteriorate in such a way as to give erratic and unsatisfactory temperatures.

Thousands of Kold-Hold Cooling Units are already in daily use. Many, many added installations soon will be made in all parts of the country—affording real opportunity of added revenue for those who can handle the installation and service.

Kold-Hold is thoroughly proven the most economical, reliable, and advantageous system of truck refrigeration. IT'S HERE TO STAY.

Write NOW for illustrated folder 106.

KOLD-HOLD is fully protected by U. S. and Foreign Patents and Applications Pending.
U. S. Patents Nos. 1,568,102, Re. 18,826, 1,969,124, 1,979,617, 2,007,288, 2,052,014.

KOLD-HOLD MANUFACTURING COMPANY

Olds Tower Bldg. **Lansing, Mich.**

COMMERCIAL REFRIGERATION

By L. K. WRIGHT

A *brand new* book on the Application of Small Commercial Refrigeration Units to:

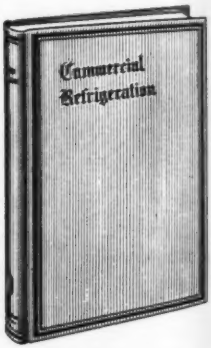
Markets
Dairies
Restaurants
Bakeries
Air Conditioning
Ice Cream
Drinking Water

for the use of:

Engineers
Designers
Estimators
Salesmen
Servicemen
Students

THIS new book covers the entire field of commercial refrigeration in the smaller installations. With it you are equipped to undertake practically any job, from the original estimate to the operation, and be *sure* you are following the most efficient and economical methods.

The detailed instructions are based on practical experience and actual installations, they tell you *how* to do the job without expensive mistakes and oversights.



Over 400 pages . . . Size 6 x 9 inches . . . 147 charts and illustrations . . . 150 tables.

PRICE $3.50

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435 N. Waller Ave., Chicago

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SERVICE ENGINEERS: Drop in at our booth and see the great new MILLS COMPRESSOR at the *Memphis Show* on November 11,12,13

Mills Novelty Co., 4100 Fullerton Ave., Chicago, Ill.

YOU KEPT US WORKING NIGHTS

And NOW . . . .

We want to meet you . . . . . personally.

You Refrigeration Service Engineers who have been using Wolverine Seamless Copper Tubing all year. Bending it, Flaring it, Cutting it, Soldering it. Doing the difficult and unusual job. You've helped to keep our factory going full blast. We want to thank you for working us overtime, for giving extra men, extra hours with pay.

We're going to be at the Refrigeration Service Engineers Convention. Please stop in at our booth and pay us a call. Let's talk things over. See for yourself how Wolverine Seamless Tubing is made. Why it is easy to bend, cut, flare, solder, and why it fits any standard solder or compression fitting on the market.

• • •

WOLVERINE TUBE COMPANY

Seamless BRASS COPPER ALUMINUM TUBING

1415 Central Avenue **Detroit, Michigan**

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Use The R. S. E. SERVICE DEPARTMENT

—It's for Your Convenience

THIS department is conducted for the convenience of our subscribers. We will ask the manufacturers and distributors to send you the latest information on the items checked.

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- ☐ Bushings, Motor
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- ☐ Charging Hose
- ☐ Charging Stand
- Coils
  - ☐ Fin
  - ☐ Pipe
- ☐ Compressors
- Condensers
  - ☐ Air Cooled
  - ☐ Water Cooled
- ☐ Condenser Water Regulators
- ☐ Connecting Rods
- Controls
  - ☐ Cold
  - ☐ Humidity
  - ☐ Liquid Level
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  - ☐ Temperature
- Refrigerants
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  - ☐ Methyl Chloride
  - ☐ Carrene
  - ☐ Freon
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  - ☐ Ethyl Chloride
- Refrigerator Dishes
  - ☐ Glass
  - ☐ Porcelain
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- ☐ Seals, Shaft
- ☐ Resurfacing Stones
- Strainers
  - ☐ Expansion and Float Valve
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  - ☐ Suction Line
- Switches
  - ☐ Air Temperature
  - ☐ High Pressure Control
  - ☐ Low Pressure Control
  - ☐ Pressure
  - ☐ Temperature
- ☐ Mercury
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  - ☐ Air Temperature (Cooling)
  - ☐ Air Temperature (Heating)
  - ☐ Brine
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Write in Names of Products Not Listed

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THE REFRIGERATION SERVICE ENGINEER
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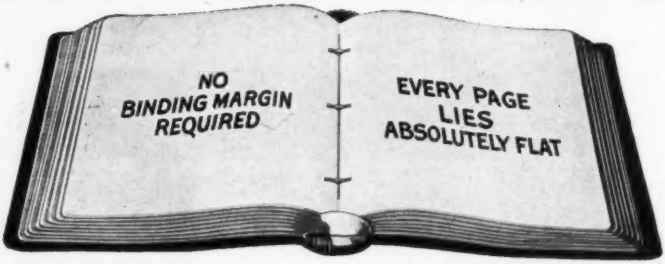

Every issue of this magazine will have valuable information which you will want to retain for future reference.

Here is a handy, substantial binder that permits you to add each copy readily as it is received. The binder is so constructed that regardless of the number of issues, every page lies flat and is easily read.

Holds twelve issues—an entire year's supply. No hunting around for lost or missing issues. The entire year's edition is always handy.

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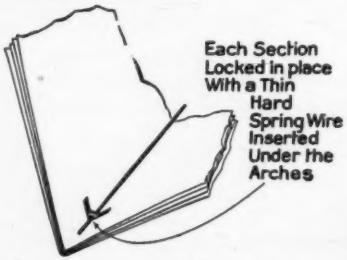

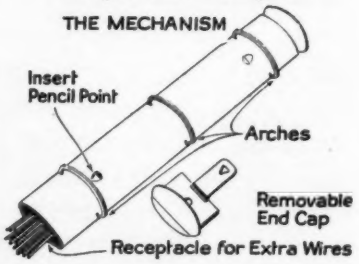

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Each issue is locked in place with spring wire. It takes only an instant to add an issue. Reserve supply of extra wires for future issues is kept in the back-bone of the binder. File your copies promptly as received.

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433 NORTH WALLER AVE. CHICAGO, ILL.

DRYERS • STRAINERS
LINE VALVES AND
SERVICE TOOLS FOR
REFRIGERATION
AND
AIR CONDITIONING.

In Appreciation

Having just passed through the most successful season in our history, it is only proper that we express our sincere gratitude to refrigeration service engineers for their loyal support.

Our every effort has been centered upon the making of products of advanced design with a quality second to none. We regard the good will of each and every service engineer as a most valuable asset.

To those who attend the third annual convention of the Refrigeration Service Engineers' Society at Memphis, we extend a cordial invitation to visit our display.

Stocked by Leading Jobbers Everywhere

Get acquainted at BOOTH 12

HENRY VALVE COMPANY

1001-19 North Spaulding Avenue, Chicago, Ill.

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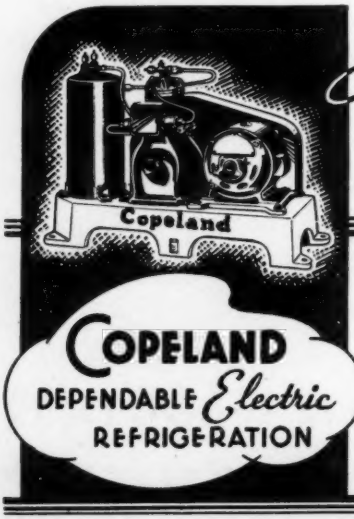

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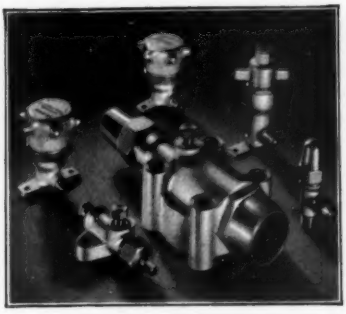

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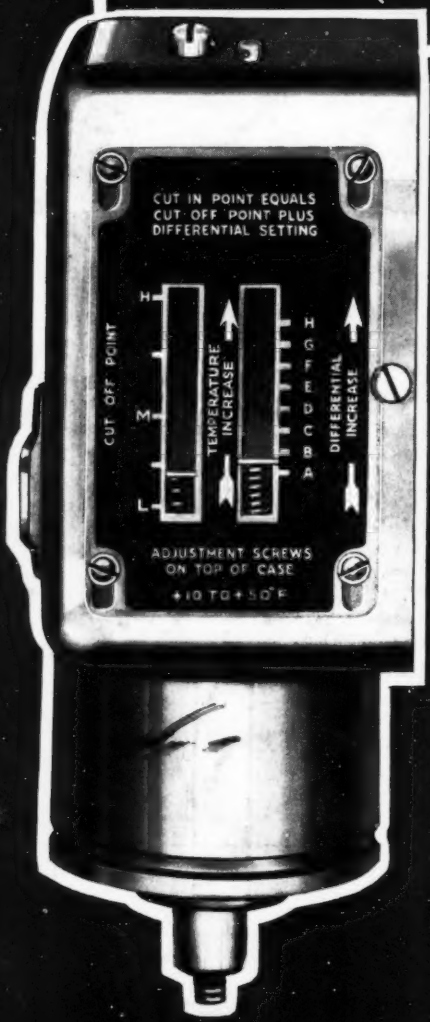

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